Cerro Coso College

Course Outline of Record Report

02/23/2022

CHEMC113H : General Inorganic Chemistry II: Honors Undergraduate Laboratory Research

General Information

Author:	• Vivian Baker • Stenger Smith, John • Swiridoff, Christine
Course Code (CB01) :	CHEMC113H
Course Title (CB02) :	General Inorganic Chemistry II: Honors Undergraduate Laboratory Research
Department:	Science
Proposal Start:	Fall 2018
TOP Code (CB03) :	(1905.00) Chemistry, General
SAM Code (CB09) :	Non-occupational
Distance Education Approved:	Yes
Course Control Number (CB00) :	CCC000556356
Curriculum Committee Approval Date:	11/03/2017
Board of Trustees Approval Date:	12/14/2017
External Review Approval Date:	12/14/2017
Course Description:	In this course students learn about modern materials, properties of solutions,kinetics, chemical and aqueous equilibrium, acids and bases, environmental chemistry, thermodynamics, electro-chemistry, nuclear chemistry, metallurgy, chemical trends in the periodic chart, coordination compounds, and bioorganic chemistry. The honors course provides more content in the form of advanced topics in chemistry and requires greater intensity and depth of study in laboratory research above and beyond that of the non-honors class.
Submission Type:	Change to Content I am changing the contact hours of Chem C113H, based upon input from the American Chemical Society. Review and update content and SLOs. Update textbook.
Author:	No value

Faculty Minimum Qualifications

Master Discipline Preferred:	• Chemistry
Alternate Master Discipline Preferred:	• Chemistry
Bachelors or Associates Discipline Preferred:	No value
Additional Bachelors or Associates Discipline Preferred:	No value

Course Development Options

Basic Skills Status (CB08)

Course is not a basic skills course.

Course Special Class Status (CB13)

Course is not a special class.

Grade Options

- Pass/No Pass
- Letter Grade Methods

☐ Allow Students to Gain Credit by Exam/Challenge

Allowed Number of Retakes

0

Course Prior To College Level (CB21)

Not applicable.

Rationale For Credit By Exam/Challenge

No value

Retake Policy Description

Type:|Non-Repeatable Credit

☑ Allow Students To Audit Course

Course Support Course Status (CB26)

No value

Associated Programs

☑ Course is part of a program (CB24)

Associated Program	Award Type	Active
CC Liberal Arts: Mathematics & Science	A.A. Degree Major	Summer 2018 to Fall 2020
CSU General Education (CSU GE Breadth) (In Development)	Certificate of Achievement	Fall 2021
Intersegmental General Education Transfer Curriculum Certificate of Achievement (In Development)	Certificate of Achievement	Fall 2021
Nutrition and Dietetics Associate in Science Degree for Transfer (AS-T)	A.S. Degree for Transfer	Fall 2019 to Spring 2020
CSU General Education (CSU GE Breadth)	Certificate of Achievement	Fall 2020
Intersegmental General Education Transfer Curriculum Certificate of Achievement	Certificate of Achievement	Fall 2020
Nutrition and Dietetics Associate in Science Degree for Transfer (AS-T)	A.S. Degree for Transfer	Spring 2020 to Spring 2022
Liberal Arts: Mathematics & Science Associate in Arts Degree	A.A. Degree Major	Fall 2020

Nutrition and Dietetics Associate in Science Degree for Transfer (AS-T)	A.S. Degree for Transfer	Spring 2022

Transferability & Gen. Ed. Options

Course General Education Status (CB25)

No value

Transferability

Transferable to both UC and CSU

Transferability Status

Approved

CSU General Education Certification	Categories	Status	Approval Date	Comparable Course
Area B.1	Scientific Inquiry & Quantitative Reasoning Physical Sciences	Approved	No value	CHEM 120S

Intersegmental General Education Transfer Curriculum	Categories	Status	Approval Date	Comparable Course
Area 5.A	Physical & Biological Sciences Physical Science	Approved	No value	No Comparable Course defined.
Area 5.C	Physical & Biological Sciences Laboratory/Activity	Approved	No value	

Units and Hours

Summary

Minimum Credit Units (CB07)	6
Maximum Credit Units (CB06)	6
Total Course In-Class (Contact) Hours	180
Total Course Out-of-Class Hours	144
Total Student Learning Hours	324
Faculty Load	0

Credit / Non-Credit Options

Course Credit Status (CB04)	Course Non Credit Category (CB22)	Non-Credit Characteristic

Credit - Degree Applicable	Credit Course.	No Value

Course Classification Status (CB11)

Credit Course.

Funding Agency Category (CB23)

Not Applicable.

Cooperative Work Experience Education Status (CB10)

Variable Credit Course

Weekly Student Hours

	In Class	Out of Class
Lecture Hours	4	8
Laboratory Hours	6	0
Activity Hours	0	0

Course Student Hours

Course Duration (Weeks)	18
Hours per unit divisor	54
Course In-Class (Contact) Hours	
Lecture	72
Laboratory	108
Activity	0
Total	180
Course Out-of-Class Hours	
Lecture	144
Laboratory	0
Activity	0
Total	144

Time Commitment Notes for Students

No value

Faculty Load

Extra Duties: 0

Faculty Load: 0

Units and Hours - Weekly Specialty Hours

Activity Name	Type	In Class	Out of Class
No Value	No Value	No Value	No Value

Pre-requisites, Co-requisites, Anti-requisites and Advisories

Prerequisite

CHEMC111 - General Inorganic Chemistry I

Chem C113H is the second semester of a full-year Chemistry course. All Colleges and Universities require the first semester. Students need skills in the laboratory, balanced chemical equation calculations, and knowledge of the reactivity of elements and compounds gained in Chem C111 to succeed in Chem C113.

AND

Prerequisite

ENGLC070 - Introductory Composition

This is an Honors Program Requirement. This chemistry Honors course requires students to write a 2500 word essay on their research topic. English C070 prepares students for such tasks by teaching them how to research and analyze college-level readings and to compose various types of essays.

Entrance Skills

Entrance Skills	Description
No value	No value

Limitations on Enrollment

Limitations on Enrollment	Description
No value	No value

Specifications

Methods of Instruction

Methods of Instruction	Other
Rationale	Recitation by Students to cover the entire detailed topical outline with emphasis on questions that require the integration of 2 or more skills/topics covered in the lecture. Presentation and Discussion of advanced topics for the Honors session. Example: The systematic treatment of Chemical Equilibrium.
Methods of Instruction	Lecture
Rationale	Lectures to cover the relevant topics and entire detailed topical outline over the course of the semester.
Methods of Instruction	Outside reading

Rationale	No value
Methods of Instruction	Problem Solving
Rationale	No value
Methods of Instruction	Project-based learning
Rationale	No value
Methods of Instruction	Guest Lecturers
Rationale	No value
Methods of Instruction	Laboratory
Rationale	Laboratory Experiments to cover and reinforce the entire detailed topical outline, and often require integration of 2 or more skills/topics covered in lecture.
Methods of Instruction	Discussion
Rationale	No value
Methods of Instruction	Field Trip
Rationale	Field trips to Local laboratories to provide real life examples of 2 or 3 topics in the detailed topical outline. Example: A field trip to the chemistry division at the China Lake NAWC will cover acid base equilibrium.
Methods of Instruction	Group Work
Rationale	No value
Methods of Instruction	Demonstration
Rationale	No value

Assignments

Out of class assignments may include but are not limited to

A. Homework: Students are required to solve 15 to 30 homework problems of various degrees of difficulty each week. Each assignment has problems that involve reinforcement of topics covered in the lecture as well as problems with involve the integration of several techniques to solve relevant

chemistry problems. Example: students are required to find out the empirical formula of a substance from elemental analysis results.

B. Laboratory Reports: Students are required to write laboratory reports based upon data that was gathered in the lab. The reports must include results of the laboratory experiment (such as the identity of an unknown or the percentage composition of an unknown compound) as well as relevant problems from the laboratory text which reinforce the lab technique(s) used in the experiment. Example: Students are required to report on the concentration and pKa of an unknown acid.

C. Textbook Readings: Students are expected to read each of the chapter in advance of the lecture. The chapters cover new material and are written at college-level english with many new technical terms, and must often be read more than once.

D. Background Research: As topics arise, students may need to perform background research and be ready to discuss in class. For example: Solar photovoltaic systems and new materials.

E. Research and production of progress reports and a final original research paper on the Honors topic. Example: A student will present work on his/her original laboratory research

Methods of Evaluation	Rationale
Other	Exams evaluate the students' ability to apply techniques taught in class and apply these techniques in problem solving. • Example: The first midterm exam comprises answers that require determination of the dependence of concentration on rate of reaction (rate law calculation).
Other	Laboratory reports measuring the student's ability to perform techniques, to identify unknowns, assess accuracy and precision where appropriate. • Example: One of the laboratory experiments involves determination of the molecular weight percent of and unknown material based upon the ability of the unknown to depress the freezing point of sulfur (Colligative properties).
Other	Laboratory participation measuring the ability to work in groups, preparation level, and attention to safety • Example: Students are required to wear the appropriate level of protection (eye protection is always required), and dispose of waste chemicals in the appropriate containers
Homework	Regular homework assignments reinforce material learned in class and evaluate the student's ability to learn outside the classroom. • Example: Homework assigned on the relevant chapter which covers the application of the Nernst equation
Research Paper	Participation in the Honors Laboratory Research Example: Students will perform lab experiments outside of the scope of Chem C113 according to the ACS Program Review input given to Cerro Coso. Presentation of an Original Research Paper. Synthesis and presentation of an original research topic to the honors class that is above and beyond the level of the Chem C113 class Example: Students research and present a paper on a general chemistry experiment for review into possible inclusion into future course offerings.

Equipment

No Value

Textbooks

Author	Title	Publisher	Date	ISBN
	Nelson, J. H. & Kemp, K. C. . (2018) Chemistry the Central Science, Laboratory Experiments, 14th , Prentice Hall			

Brown, T E., LeMay, H. E. &
Bursten, B. E. . (2018) Chemistry:
The Central Science, 14th ,
Prentice Hall

Other Instructional Materials

No Value

Materials Fee

No

Learning Outcomes and Objectives

Course Objectives

No value

CSLOs

Perform analyses involving calculations including acid base titrations, electrochemical potentials, concentration calculations, equilibrium constants, speed of reactions (kinetics) and perform integrated exercises based upon one or more of the previously listed topics. Expected SLO Performance: 70.0

Science Liberal Arts: Mathematics & Science AA Degree	Apply algebraic, graphical, numerical, and other methods to solve applied problems in the areas of mathematics, natural sciences, computer graphics, and computer animation.
Social Science IGETC PLOs	Communicate scientific results by applying the appropriate scientific method, including experimental and empirical methodologies characteristic of science and modern methods and tools used in scientific inquiry through the use of graphs, oral communications, and writings.
Social Science PLOs for CSU GE COA	Communicate scientific results by applying the appropriate scientific method, including experimental and empirical methodologies characteristic of science and modern methods and tools used in scientific inquiry through the use of graphs, oral communications, and writings.

Assess equations involving changes in enthalpy, free energy, entropy, free energy and entropy as they relate to equilibrium, kinetics, activation energy, and heats of reaction and formation Expected SLO Performance: 70.0

Describe the structure of the atom and give appropriate electronic configuration of molecules and properties of the molecules using the periodic chart and predict chemical properties of halogen containing compounds, noble gas compounds, group VI containing compounds, group V containing compounds, group IV containing compounds transition metal compounds, metal compounds, and radioactive compounds Expected SLO Performance: 70.0

Calculate the driving force behind electrochemical reactions Expected SLO Performance: 70.0

Analyze the properties of various metals such as electrical conductivity, oxidation potential. Expected SLO Performance: 70.0

Apply nature of electronic interactions to crystal field theory. Expected SLO Performance: 70.0

Interpret and draw organic chemistry functional groups and short-hand structures of organic compounds. Expected SLO Performance: 70.0

Design and safely perform scientific experiments, including recording and analyzing the results. Expected SLO Performance: 70.0

Science Liberal Arts: Mathematics & Science AA Degree	Describe the nature of science, the methods applied in scientific investigations, and the value of those methods in developing a rigorous understanding of the physical world.

Research special topics in chemistry, and apply these concepts towards the synthesis of an original research paper and presentation (Honors).
Expected SLO Performance: 70.0

Outline

Course Outline

A. Properties of Solutions
1. Solution Process
2. Saturated Solutions
3. Solubility Factors
4. Concentration
5. Colligative Properties
6. Colloids

B. Chemical Kinetics
1. Reaction Rates
2. Concentration and Rates
3. Concentration versus Time
4. Temperature and Rate
5. Reaction Mechanism
6. Catalysis

C. Chemical Equilibrium
1. The Concept of Equilibrium
2. Equilibrium Constant
3. Heterogeneous Equilibrium
4. Applications of Equilibrium
5. Le Chatelier's Principle

D. Acid-Base Equilibrium
1. Review of Acids and Bases
2. Bronsted Acids
3. Auto ionization of Water
4. pH Scale
5. Strong Acids and Bases
6. Weak Acids
7. Weak Bases
8. Lewis Acids and Bases

E. Aqueous Equilibria
1. The Common Ion Effect
2. Buffers
3. Titrations
4. Solubility Equilibrium
5. Solubility Factors
6. Precipitation
7. Quantitative Analysis of Metallic Elements

F. Chemistry of the Environment
1. Earth's Atmosphere
2. Outer Regions of the Atmosphere

3. Ozone
4. Troposphere
5. Oceans
6. Freshwater

G. Chemical Thermodynamics
1. Spontaneous Processes
2. Entropy
3. Entropy Changes
4. Gibbs Free Energy
5. Free Energy and Temperature
6. Free Energy and the Equilibrium Constant

H. Electrochemistry
1. Oxidation Reduction Reactions
2. Balancing Redox Reactions
3. Voltaic Cells
4. Cell Electromotive Force
5. Spontaneity of Redox Reactions
6. Batteries, Corrosion and Electrolysis

I. Nuclear Chemistry
1. Radioactivity
2. Patterns of Stability
3. Transmutation
4. Radioactive Decay
5. Nuclear Fission and Fusion

J. Chemistry of Nonmetals
1. Trends in the Periodic Chart
2. Hydrogen
3. Noble Gases
4. Halogens
5. Oxygen
6. Group VI Elements
7. Nitrogen
8. Group V Elements
9. Carbon
10. Group IV Elements
11. Boron

K. Metals and Metallurgy
1. Occurrence of Metals
2. Pyrometallurgy
3. Hydrometallurgy
4. Electrometallurgy
5. Metallic Bonding
6. Alloys
7. Transition Metals
8. Iron, Chromium and Copper

L. Chemistry of Coordination Compounds
1. Complexes
2. Chelates
3. Isomerism
4. Color and Magnetism
5. Crystal Field Theory

M. Organic Chemistry
1. Basic Structures and Isomers
2. Alkanes, Alkenes and Alkynes
3. Functional Groups
4. Simple reactions

5. Bio Organic Molecules
6. Polymers

N. Honors Topic
1. Preparation of Reagents
2. Isolation and Purification
3. Analysis and Yield
4. Report Submission

The experiments performed in the laboratory portion of this course take place under the supervision of the instructor in a chemistry laboratory. All experiments (including those in the Honors Section) are hands-on and are designed to reinforce concepts learned in the classroom as well as to teach general chemistry methods.

Lab Outline

The laboratory portion augments the lecture portion of the course. It consists of: practical experiments that lead to the understanding of chemical principles, writing of laboratory reports,
and discussion of results.
Example: Students perform a clock reaction experiment to determine the rate constants and reaction order then submit the report.

Laboratory Experiments and Reports Include but not limited to:

A. 1 Colligative Properties:Freezing Point Depression and/or Boiling Point Elevation
B. 2 Rate of Chemical Reaction: Example: Clock Reaction
C. 3 Quantitative Titration of Acids and Bases
D. 4 The Dissociation Constant of a Weak Acid
E. 5 Determination of the Solubility Product
F. 6 Oxidation Reduction Reactions
G. 7 Qualitative Analysis of unknown solutions of several ions
H. 8 Selected Organic Experiment: Example Synthesis and Properties of Aspirin.

Delivery Methods and Distance Education

Delivery Method: Please list all that apply -Face to face -Online (purely online no face-to-face contact) -Online with some required face-to-face meetings ("Hybrid") -Online course with on ground testing -iTV – Interactive video = Face to face course with significant required activities in a distance modality -Other

Face 2 Face true

Rigor Statement: Assignments and evaluations should be of the same rigor as those used in the on-ground course. If they are not the same as those noted in the COR on the Methods of Evaluation and out-of-class assignments pages, indicate what the differences are and why they are being used. For instance, if labs, field trips, or site visits are required in the face to face section of this course, how will these requirements be met with the same rigor in the Distance Education section?

No Value

Effective Student-Instructor Contact: Good practice requires both asynchronous and synchronous contact for effective contact. List the methods expected of all instructors teaching the course. -Learning Management System -Discussion Forums -Moodle Message -Other Contact -Chat/Instant Messaging -E-mail -Face-to-face meeting(s) -Newsgroup/Discussion Board -Proctored Exam -Telephone -iTV - Interactive Video -Other (specify)

Software and Equipment: What additional software or hardware, if any, is required for this course purely because of its delivery mode? How is technical support to be provided?

No Value

Accessibility: Section 508 of the Rehabilitation Act requires access to the Federal government's electronic and information technology. The law covers all types of electronic and information technology in the Federal sector and is not limited to assistive technologies used by people with disabilities. It applies to all Federal agencies when they develop, procure, maintain, or use such technology. Federal agencies must ensure that this technology is accessible to employees and the public to the extent it does not pose an "undue burden". I am using -iTV—Interactive Video only -Learning management system -Publisher course with learning management system interface.

No Value

Class Size: Good practice is that section size should be no greater in distance ed modes than in regular face-to-face versions of the course. Will the recommended section size be lower than in on-ground sections? If so, explain why.

No Value