

Eastern Illinois University
New Course Proposal
CHM 1310G, General Chemistry I

1. Catalog Description

CHM 1310G General Chemistry I. (3-0-3) F,S. Short title: Gen.Chem. I

An introduction to fundamental chemical principles and related phenomena. Topics include: atomic and electronic structure, bonding, chemical composition, chemical reactions, gases, stoichiometry, and thermochemistry. CHM 1315G must be taken concurrently. Prerequisite: One year of high school chemistry or credit in CHM 1040G with a grade of C or better. Not recommended for those whose ACT mathematics score is less than 21 without prior completion of or concurrent enrollment in MAT 1271.

Writing active.

2. Student Learning Objectives

Goal: EIU students will demonstrate the ability to think critically.

Objectives: Students will:

- a. demonstrate an understanding of the relationship between tabular and graphical data.
- b. demonstrate an understanding of the relationships presented in the graphical presentation of data.
- c. demonstrate an understanding of various physical states of matter.
- d. describe the current model of atomic structure and relate this model to the macroscopic properties of elements and compounds.
- e. use modern bonding theories to rationalize the structures of chemical compounds.
- f. be able to properly write the formulas of chemical compounds.
- g. demonstrate an understanding of chemical reactions at the molecular level.
- h. predict energy changes associated with chemical reactions.
- i. demonstrate a quantitative understanding of chemical reactions.
- j. develop their problem-solving skills.

3. Course Outline

Week 1	Matter and Measurement <ul style="list-style-type: none">• Classification and properties of matter• Uncertainty in measurement• Dimensional Analysis in problem solving
Week 2	Atoms, Molecules, and Ions <ul style="list-style-type: none">• Atomic theory of matter and the modern view of atomic structure• The Periodic Table• Naming ionic and molecular compounds
Weeks 3 - 4	Stoichiometry: Calculations with Chemical Formulas and Equations <ul style="list-style-type: none">• Writing and balancing chemical equations• The mole concept• Quantitative information from chemical equations
Weeks 5 - 6	Aqueous Reactions and Solution Stoichiometry <ul style="list-style-type: none">• General properties of aqueous solutions• Precipitation, acid-base, and oxidation-reduction reactions• Calculation of solution concentrations

	<ul style="list-style-type: none"> Quantitative information from solutions / chemical analyses
Week 7	<p>Thermochemistry</p> <ul style="list-style-type: none"> First Law of Thermodynamics Enthalpy and enthalpy of reactions Calorimetry and Hess's Law
Weeks 8 - 9	<p>Electronic Structure of Atoms</p> <ul style="list-style-type: none"> Wave and particle nature of light Bohr model of the hydrogen atom Introduction to quantum chemistry and atomic orbitals Electron configurations of elements and relationship to the Periodic Table
Week 10	<p>Periodic Properties of the Elements</p> <ul style="list-style-type: none"> Development of the Periodic Table Ionization energy and electron affinity Metals, nonmetals, metalloids Group trends for various periodic properties of the elements
Week 11	<p>Basic Concepts of Chemical Bonding</p> <ul style="list-style-type: none"> Ionic and covalent bonding Lewis structures and the octet rule Bond polarity and electronegativity Resonance structures and assignment of formal charges Exceptions to the octet rule
Week 12	<p>Molecular Geometry and Bonding Theories</p> <ul style="list-style-type: none"> Valence Shell Electron Pair Repulsion Theory (VSEPR) Molecular shape Polarity of molecules Hybrid orbitals and multiple bonds
Week 13	<p>Gases</p> <ul style="list-style-type: none"> Characteristics of gases The gas laws and the ideal gas equation Gas mixtures and partial pressures Kinetic-molecular theory, effusion, diffusion Real gases and deviations from ideal gas behavior
Week 14	<p>Intermolecular Forces, Liquids, and Solids</p> <ul style="list-style-type: none"> Phase changes and phase diagrams Ion-dipole, dipole-dipole, London Dispersion forces Hydrogen bonding Vapor pressure Structures of solids
Week 15	<p>Properties of Solutions</p> <ul style="list-style-type: none"> Saturated solutions and solubility Factors affecting solubility Colligative properties (freezing point depression, boiling point elevation, osmotic pressure)

4. Evaluation of Student Learning

- a. The students will be evaluated by assignment of homework problems and/or quizzes and exams on a regular basis. A comprehensive final exam will also be administered.
- b. The "writing active" designation is justified since many exams and quizzes require both short-answer and problem-solving skills.

5. Rationale

- a. This course fits into the physical science component of the scientific awareness segment. It provides an introduction to the description of matter and fundamental principles that will enable students to more accurately assess scientific information. In addition, the course will strengthen the reasoning ability of the students especially through the application of problem-solving techniques. The application of chemical principles to modern technological problems will also help promote intellectual curiosity.
- b. This course will be taught at the 1000-level because it is an introductory course. Prerequisite: One year of high school chemistry or CHM 1040G with a grade of C or better. Prior completion of or concurrent enrollment in MAT 1271 is recommended for students whose ACT mathematics score is less than 21. CHM 1315G must be taken concurrently with CHM 1310G.
- c. This course will be similar to the current CHM 1310 and will replace it. It will maintain the same curriculum ID as CHM 1310.
- d. This course is required for all options and concentrations in the BS in Chemistry and all minors in chemistry. It is required for all majors in biological sciences, physics, family and consumer sciences dietetics option, industrial technology, clinical laboratory science, engineering, and geology. It is a requirement in the medical professions programs such as pre-dentistry, pre-medicine, and pre-veterinary, as well as the pre-engineering program. It is also a requirement in the earth science with teacher certification and physics with teacher certification minors.

6. Implementation

- a. The course will be assigned initially to the current General Chemistry faculty: Dr. Klarup, Dr. Blitz, Dr. R. Keiter, Dr. McGuire, Dr. Lawrence, Dr. Deakyne, Dr. Marquart, Dr. Sheeran, Dr. Easter, Dr. Furumo.
- b. Textbook: Brown, T.L.; LeMay, H.E., Jr.; Bursten, B.E. *Chemistry: The Central Science*, 8th ed.; Prentice Hall: Upper Saddle River, New Jersey, 2000.
- c. There are no additional costs to the student.
- d. Spring 2001

7. Community College Transfer

A community college course may be judged equivalent to this course.

8. Date approved by the department: 4/11/00

9. Date approved by the college curriculum committee: 4/21/00

10. Date approved by CAA: 10/19/00

Departmental Contact Person: Dr. Doug Klarup (x 6227)