

BLINN COLLEGE
MASTER COURSE SYLLABUS

CHEMISTRY 1405

CIP # 40.0501.51 03

CIP Area: Physical Sciences

Fall, 2005

Prepared by:

Bryan Campus / Date

Confirmed by:

Division Chair, Brenham Campus / Date

Division Chair, Bryan Campus / Date

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Chem 1405 Introductory Chemistry I

This course is in the core curriculum.

Purpose Statement

The purpose of the natural sciences component in the core curriculum is to enable the student to understand the basic concepts in the natural sciences and to apply that understanding to the analysis of current issues in society. In particular, mastering introductory chemistry requires a basic understanding of fundamentals and will enable the student to use these fundamentals to analyze, classify, and predict how chemical systems and industrial processes occur. .

Course Description

1. An introduction to the fundamentals and principles of chemistry as related to man's culture and environment. Designed for liberal arts and non-science majors. Cannot be substituted for CHEM 1411. Three class hours and three laboratory hours per week. Credit: Four semester hours.
2. The major areas which will be covered in lecture are:
 - a. Matter, Measurements and Calculations
 - b. Atoms and Molecules
 - c. Electronic structure and the Periodic Law
 - d. Forces Between Particles
 - e. Chemical Reactions
 - f. The States of Matter
 - g. Solutions and Colloids
 - h. Reaction Rates and Equilibrium
 - i. Acids, Bases and Salts
 - j. Radioactivity and Nuclear Processes

The major areas which will be covered in lab are:

- a. Safety Orientation
- b. Laboratory Notebook
- c. Measurements and Significant Figures
- d. The Use of Chemical Balances
- e. Uses of Glass Ware and Density Determination
- f. Physical and Chemical Changes
- g. Separations and Analysis
- h. Classification of Chemical Reactions
- i. Decomposition Reactions
- j. Determination of Half-Life
- k. Solution Formation and Characteristics
- l. Acids, Bases, and Salts
- m. Analysis of Vitamin C
- n. Analysis of Sea Water

3. Chem 1405 earns four credit hours.
4. Prerequisite: None
5. This is a Core Course in the 42-hour Core of Blinn College; more can be found at www.blinn.edu/corecurriculum/. As such, students will develop proficiency in the appropriate Intellectual Competencies, Exemplary Educational Objectives, and Perspectives, as follows:
 - a. Intellectual Competencies
 - i. **Reading:** The ability to analyze and interpret a variety of printed materials, books, documents and articles – above the 12th grade level.
 - ii. **Writing:** The ability to produce clear, correct and coherent prose adapted to purpose, occasion and audience– above the 12th grade level.
 - iii. **Listening:** The ability to analyze and interpret various forms of spoken communication, possess sufficient literacy skills of writing, reading – above 12th grade level.
 - iv. **Critical Thinking:** The ability to think and analyze at a critical level.
 - v. **Computer Literacy:** The ability to understand our technological society; use computer-based technology in communications, solving problems, acquiring information.
 - b. Exemplary Educational Objectives
 - i. To understand and apply method and appropriate technology to the study of natural sciences.
 - ii. To recognize scientific and quantitative methods and the differences between these approaches and other methods of inquiry and to communicate findings, analyses, and interpretation both orally and in writing.
 - iii. To identify and recognize the differences among competing scientific theories.
 - iv. To demonstrate knowledge of the major issues and problems facing modern science, including issues that touch upon ethics, values, and public policies.
 - v. To demonstrate knowledge of the interdependence of science and technology and their influence on, and contribution to, modern culture.
 - c. Perspectives
 - i. To recognize the importance of maintaining health and wellness.
 - ii. To develop a capacity to use knowledge of how science and technology affect their lives.
 - iii. To use logical reasoning in problem solving.
 - iv. To integrate knowledge and understand the interrelationships of the scholarly disciplines.

Course Objectives and Student Learning Outcomes

Upon completion of the course, the student will have an overall average of $\geq 60\%$ of the combined lecture and laboratory components of the course. This includes at least 3 to 4 major exams and chapter/weekly quizzes given at the discretion of the Instructor. In the laboratory the student will successfully complete the experiments with the accompanying reports. The student will demonstrate in the laboratory an understanding of the experiment through analysis of the data and being able to use this data to solve problems and predict the outcome of similar reactions and/or experiments.

These learning outcomes will include the student showing competence in the course objectives that are listed below:

The course objectives are:

From Lecture:

1. Understand the definitions of matter, physical and chemical changes and the states of matter. Understand and be able to use the metric system, significant figures and scientific notation by problem solving.
2. Learn the symbols for the elements and how to write chemical formulas. Understand the structure of the atom. Learn the definitions of mole and molecular weight and be able to use them in calculations.
3. Learn the electronic configuration of the elements and determine how this correlates with the shape of the periodic chart. Understand the property trends in the periodic chart.
4. Learn about the major forces between particles. Learn how to name chemical compounds. . Learn the shapes and polarities of molecules.
5. Students will learn how to write chemical equations and how to distinguish among redox, decomposition, replacement, combination and ionic types. These reactions will be used to calculate material balances including limiting reactants and reaction yields.
6. Students will relate physical properties to the three states of matter and be able to apply the kinetic molecular theory of matter. They will learn all the gas laws and how they relate to the kinetic molecular theory.
7. The student will learn the solution process, solution properties and solution concentrations.
8. The student will learn the meaning of reaction rates and how they are influenced. They will learn the definition of chemical equilibrium and what factors influence it. They will learn how the Le Chatelier's principle applies to a system at equilibrium.
9. The student will be able to identify Lewis and Bronsted acids and bases, name common acids, do calculations involving pH and write equations for neutralization.
10. The student will be able to describe and characterize the forms of radiation emitted during radioactive decay and other nuclear processes. They will also be able to balance nuclear equations and solve problems using the half-life concept. They will be able to describe the difference between fission and fusion reactions.

From Laboratory:

1. Demonstrate familiarity with the fundamentals of laboratory safety.
2. Learn how to keep a laboratory notebook and enter the laboratory data using significant figures and scientific notation.

3. Correct use of laboratory equipment.
4. Demonstrate proficiency with chemistry laboratory techniques, such as weighing, reading pipettes and burettes. The student should also learn how to accurately and precisely measure length.
5. Learn the techniques of titration including accuracy in determining end points.

Course Requirements

1. The student should do each of the following:
 - a. Read the assigned chapters in the textbook and laboratory manual.
 - b. Attend all lectures and laboratory classes.
 - c. Take notes in class.
 - d. Participate in class discussions.
 - e. Complete assigned outside reading material and homework.
 - f. View audiovisual materials on selected topics.
 - g. Use the computer software in the lab and/or classroom as it is assigned.
 - h. Complete the exams on the assigned dates; the exams may include essay questions.
2. For laboratory the student should:
 - a. Read and comprehend each experiment assigned in the laboratory manual and complete the prelab assignment before going into the lab.
 - b. Successfully complete each experiment.
 - c. Learn to use and/or analyze data from instruments which are needed to complete the experiments. (balance, burette, pipette, etc.)
 - d. Complete the laboratory reports, including identifying any compounds that were synthesized and isolated and any unknowns which are assigned.
3. The Instructor should consider assigning a library assignment on topics relating to the course. The assignment should require both written and oral reports by the student. This may or may not be used for additional credit.

Grading System

The following areas will be clearly outlined by the Instructor in the Course Information Sheet given to the students in the first week of the semester:

1. Major Exams: Three or four major exams covering the lecture material, evenly distributed throughout the semester.
2. Laboratory: May be included on major exams or the instructor may give quizzes covering lab material or a laboratory final exam. Represents 25% of the total grade for the class.
3. Minor Exams/Quizzes/Homework: Given at the discretion of the instructor.
4. Additional Reports or projects: Given at the discretion of the instructor.
5. Final Exam: Comprehensive exam covering the entire course required of all instructors. The final exam will represent 20 % of the total grade for the class.

Outcomes Inventory

Chemistry 1405 will be evaluated through the following methods:

1. A pre and post test instrument is used to determine the extent of improvement the class has gained during the semester.
2. Each Intellectual Competency listed above will be evaluated to measure its attainment:
 - a. To measure reading:
 1. Exam or quiz over assigned textbook readings OR
 2. Lab assignment or exam or quiz over lab book readings OR
 3. Written assignment or exam over assigned journal articles.
 - b. To measure writing:
 1. Written assignment or term paper OR
 2. Essay question on exam OR
 3. Laboratory assignment OR
 4. Laboratory report
 - c. To measure listening:
 1. Exam or quiz over lecture material AND/OR
 2. Quiz over video viewed.
 - d. To measure critical thinking:
 1. Lab assignment or exam or quiz involving problem solving.
 - e. To measure computer literacy:
 1. Quiz over Internet/CD-Rom/DVD activities OR
 2. Laboratory report

Calendar

The instructor will ensure that the course content is covered in a manner that fulfills the course objectives. The instructor will also provide Course Information Sheets to the students and the administration during the first week of the semester. Important details including tentative examination dates and due dates for assignments are provided.

Week	Lecture Topic
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1	Introduction to Chemistry, Elements, and Symbols
2	Environmental Chemistry and Energy
3	Atoms and Atomic Structure
4	Atoms and Chemical Bonding
5	Nuclear Chemistry
6	Chemical Reactions
7	Reactions of Solutions, acids, and bases; Oxidation-Reduction reactions
8	Organic Compounds; Introduction to Organic Chemistry
9	Polymers
10	Water Resources
11	Gas Laws and Atmospheric Chemistry
12	Household Chemicals
13	Food and Nutrition (Optional)
14	Agricultural Chemistry (Optional)
15	Disposal of Chemical Waste (Optional)

Week	Laboratory Topic
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1	Laboratory Notebook and Orientation
2	Lab Safety; Introduction to Chemical Literature and Calculations; on-line MSDS, chemical hazard analysis
3	Use of Electronic balances, Separation of a Mixture
4	Light from Atoms
5	Use of Volumetric Measuring Equipment; pH and Acid Rain
6	Classifications of Metals and Nonmetals
7	Observation and Classification of Chemical Reactions
8	pH of Common Substances
9	Analysis of Vitamin C, Use of Volumetric Equipment
10	Observing Solution Formation and Characteristics
11	Molecular Models of Organic Molecules
12	Classification of Plastics for Recycling
13	Determination of Half-Lives
14	Work with Acids, Bases
15	Determination of Hardness of Water
15	Completion of Lab work

Materials Required

Lecture Materials:

General, Organic, and Biochemistry, 4ed, Seager and Slabaugh, Brooks/Cole, 2000 (required).

Laboratory Materials:

Safety-Scale Laboratory Experiments for General, Organic, and Biochemistry, 4ed, Seager and Slabaugh, Brooks/Cole, 2000 (required); safety goggles (required); a scientific calculator (required).

OR

Lecture Materials:

Chemistry Fundamentals: An Environmental Perspective, 2ed, Buell and Gerard, Jones and Bartlett, 2003 (required)

Laboratory Materials:

Laboratory Manual for Chemistry Fundamentals: An Environmental Perspective, 2ed, Buell and Gerard, Jones and Bartlett, 2003 (required)