

CHEMISTRY 105
CHEMISTRY AND MODERN SOCIETY I

BULLETIN INFORMATION

CHEM 105 - Chemistry and Modern Society I (4 credit hours)

Course Description:

A conceptual and qualitative approach to chemistry, its evolution, achievements, and goals and its impact on technology, the environment, and modern life and thought. (Specifically designed for non-science majors)

Note: Three lecture and three laboratory hours per week.

SAMPLE COURSE OVERVIEW

The primary purpose of this course is to offer you an understanding of how chemistry affects your everyday life. In addition, you will learn many of the fundamental principles and some of the vocabulary of chemistry. Successful completion of this course will leave you with the chemical concepts needed to appreciate the pros and cons of decisions made by businesses, politicians, and agencies such as the EPA. If your future is in teaching, both the lectures and the labs should give you sufficient background to teach the chemistry that is encountered in K-4 textbooks. The positive experience gained through this course should clearly give you the confidence and interest in promoting this central science regardless of your chosen profession.

ITEMIZED LEARNING OUTCOMES

Upon successful completion of Chemistry 105, students will be able to:

1. Describe the relationship between properties and structure of matter.
2. Name chemicals, balance chemical and nuclear equations
3. Solve problems involving mole and mass ratios in chemical reactions.
4. Identify the types of chemical reactions (i.e. acid-base, redox, nuclear) and their applications to everyday lives.
5. Explain the chemistry of household chemicals, and the composition of air and water.
6. Apply scientific reasoning to solve problems using chemical principles.
7. Evaluate substances based on periodic properties, chemical and reaction classification.
8. Perform basic laboratory techniques including data manipulation and analysis.
9. Demonstrate safe handling and disposal of laboratory equipment and chemicals.
10. Analyze and discuss the impact of scientific discovery on human thought and behavior.
11. Analyze and discuss the impact of scientific discovery on disease diagnosis and treatment.

SAMPLE REQUIRED TEXTS/SUGGESTED READINGS/MATERIALS

1. *Chemistry 105 Course Material* by Freeman, QDE Press

SAMPLE ASSIGNMENTS AND/OR EXAMS

- 1. EXAM I:** Students will employ the terminology of the study of Chemistry and will demonstrate an understanding of matter, measurements and uncertainty, Dalton's Atomic Theory, atomic composition, masses, and structure, the periodic table, the nature of light, matter as waves, quantum numbers and energy levels for multielectron atoms, electron configurations and the periodic table trends, Lewis symbols, bonding, resonance structures and bond energies and chemical nomenclature in answering the following questions:
 - a. Where is chemistry? What is the difference between basic and applied research? What is technology? What is considered a physical science? What is a biological science? What are the divisions of the natural sciences and the biological sciences? What are the properties of matter? How is matter classified? What are elements and pure substances? What are compounds? What are mixtures? What are physical & chemical properties? What are physical & chemical changes? What are chemical reactions? How do we classify matter? How do we use the symbols of elements in chemical compounds and equations? What is quantitative vs. qualitative? When, where and who developed the atomic theory? What is the structure of the atom? What are atomic and mass numbers? What are isotopes? What are atomic weights? Where are electrons located in the atom? How is the periodic table arranged? What are periodic trends? What are the main group elements and their properties?

- 2. EXAM II:** As an extension of the material from exam I, the students will demonstrate an understanding of radioactivity, atomic stability, half-life, applications of radioactivity (medicine), atomic bonding, nomenclature, shapes of molecules, intermolecular forces and historical experiments as related to modern day in order to answer the following questions:
 - a. When was radioactivity discovered? What is a nuclear change? Why do some atoms undergo radioactive decay and others don't? What are the products of this decay? Why are some radioactive isotopes more harmful than others? What are some useful applications of this process? What are ionic bonds? What are the names and formulas for ionic compounds? What are polyatomic ions? What are covalent bonds? What are the names of covalent compounds? How do we predict the shape of molecules? What are polar vs. non-polar bonds? What are the properties on ionic and covalent compounds? What are intermolecular forces? What are the states of matter? What makes water unique?

- 3. EXAM III:** As an extension of the material from exam I and II, the students will demonstrate an understanding of balanced chemical equations, the relationship between moles and molar mass, the types of reactions, energy from fuels, and alternative fuels in answering the following questions:

- a. What are balanced equations? What are moles? What are reaction rates and how do you influence them? What are equilibrium reactions? What are the first and second laws of thermodynamics? What are oxidations and reductions? How do you recognize redox reactions? What are oxidation numbers? How do we use redox reactions? How do batteries work? What are fuels? How is energy produced from fuels? What are the major types of Hydrocarbons? What are isomers and why are they important? How do you refine petroleum? What is high octane gasoline? How and why is gasoline oxygenated? What about alternative fuels?
- 4. FINAL EXAM:** Students will demonstrate an understanding of the material from exams I, II, and III, in addition to acid base reactions, buffers, pH, acid rain, and the properties of acids and bases.
- 5. LABORATORY REPORTS:** The lab component will include 8 labs, which consist of lab reports, exercises, and discussions of research methodology as related to Safety & Laboratory Techniques, the physical properties of substances, the preparation of Aspirin, energy and chemical reactions, neutralization of an acid with a base, shapes of molecules, oxidation-reduction reactions, and chemical properties of alkanes and alkenes.
- 6. HOMEWORK:** Students will demonstrate critical thinking and problem solving through the homework assignments. The assignments are based on the text book and follow the chapter progression according to the lecture schedule. The homework questions can be found at the end of each chapter.

SAMPLE COURSE OUTLINE WITH TIMELINE OF TOPICS, READINGS/ASSIGNMENTS, EXAMS/PROJECTS

<u>Week 1</u>	Class 1:	Chap 1: Introduction- Chemistry & the World Around You
	Class 2:	Chap 2: The Chemistry of Matter
<u>Week 2</u>	Class 3:	Chap 2: The Chemistry of Matter Watch Lab Safety Video
	Class 4:	Chap 2: The Chemistry of Matter
<u>Week 3</u>	Class 5:	Chap 3: A closer look at atoms and the periodic table Lab Check-In Experiment 1: Safety and Laboratory Techniques
	Class 6:	Chap 3: A closer look at atoms and the periodic table
<u>Week 4</u>	Class 7:	Chap 3: A closer look at atoms and the periodic table Experiment 2: Physical Properties of Substances
	Class 8:	Exam 1 chaps 1, 2, 3

<u>Week 5</u>	Class 9:	Chap 4: Nuclear Chemistry, The chemistry of Neutrons and Protons
	Class 10:	Chap 4: Nuclear Chemistry, The chemistry of Neutrons and Protons
<u>Week 6</u>	Class 11:	Chap 4: Nuclear Chemistry, The chemistry of Neutrons and Protons Experiment 4: The preparation of Aspirin
	Class 12:	Chap 5: Bonding of the Atoms
<u>Week 7</u>	Class 13:	Chap 5: Bonding of the Atoms
	Class 14:	Chap 5: Bonding of the Atoms
<u>Week 8</u>	Class 15:	Exam 2 Chaps 4, 5 Experiment 5: Energy and Chemical Reactions
	Class 16:	Chap 6: Chemical Reactions
<u>Week 9</u>	Class 17:	Chap 6: Chemical Reactions
	Class 18:	Chap 6: Chemical Reactions
<u>Week 10</u>	Class 19:	Chap 6: Chemical Reactions Experiment 6: Neutralization of an acid with a base
	Class 20:	Chap 6: Chemical Reactions
<u>Week 11</u>	Class 21:	Chap 8: Chemistry of Carbon, "The organics"
	Class 22:	Chap 8: Chemistry of Carbon, "The organics"
<u>Week 12</u>	Class 23:	Chap 8: Chemistry of Carbon, "The organics" Experiments 7: Oxidation-Reduction and 3: Shapes of Molecules
	Class 24:	Chap 8: Chemistry of Carbon, "The organics"
<u>Week 13</u>	Class 25:	Exam 3 Chaps 6, 8
	Class 26:	Chap 7: Reaction of Acids and Bases
<u>Week 14</u>	Class 27:	Chap 7: Reactions of Acids and Bases Experiment 8: Chemical Properties of Alkanes and Alkenes
	Class 28:	Chap 7: Reactions of Acids and Bases

Final exam according to University exam schedule