

PELLISSIPPI STATE TECHNICAL COMMUNITY COLLEGE
MASTER SYLLABUS

CONCEPTS OF CHEMISTRY
CHEM 1310

Class Hours: 3.0

Credit Hours: 3.0

Laboratory Hours: 2.0

Date Revised: Fall 02

This course is intended for transfer to LMU's and TTU's education program **ONLY**. It will not satisfy the lab science sequence requirement for the general degree.

Catalog Course Description:

Composition of matter, atomic structure, bonding, gas laws, liquid and solid states, solutions, acids and bases, chemical reactions, nuclear chemistry and technology, polymers, household chemistry, and introduction to environmental and organic/medicinal chemistry. Course includes three hours of lecture/lab and three hours of laboratory applications each week.

Entry Level Standards:

Two years of high school algebra or one year of high school algebra and one year of high school geometry are necessary for entrance to the course. This course is intended for non-science and non-pre-professional students who are considering a career in education.

Prerequisites:

Completion of DSP math requirements

Textbook(s) and Other Reference Materials Basic to the Course:

Required Textbook:

Snyder, Carl H. *The Extraordinary Chemistry of Ordinary Things*, 4th ed. John Wiley & Sons, Inc., 2002.

Required Lab Manual:

Richardson, B. C.; Snyder, Carl H. *Experience the Extraordinary Chemistry of Ordinary Things: A Laboratory Manual*. John Wiley & Sons, Inc., 2002.

Ancillary Materials:

Snyder, Carl H. *The Extraordinary Chemistry of Ordinary Things: Student Study Guide*, 4th ed. John Wiley & Sons, Inc., 2002.

Molecular Modeling Software: still in review—no cost to students

Scientific Calculator (get a an inexpensive one.)

Books on Reserve at the Parkway Campus Library, ERC Circ. Desk:

Everyday Science Explained by Curtis Suplee

Science Explained: The World of Science in Everyday Life by Colin A. Ronan (Editor)

700 Science Experiments for Everyone by Scientific and Cultural Organization

Invitations to Science Inquiry by T. Liem

Invitations to Science Inquiry Supplement to 1st and 2nd Editions by T. Liem

WebCT Access:

This course will be a “ Web Enhanced” course utilizing WebCT. Point your Web Browser to http://www.pstcc.edu/ets/dist_learn/online.html to Log-On. This webpage will be used for distribution of assignments, handouts, links to Web-based assignments and databases, and other

information as the semester progresses. Check the site frequently for new items and info!

I. Week/Unit/Topic Basis:

| Week | Topic |
|-------------|--|
| 1 | Introduction to the course |
| 2 | What is Chemistry?; Properties of Matter |
| 3 | Atoms and Atomic Structure |
| 4 | Chemical Bonding, Molecular Modeling |
| 5 | Chemical Bonding, Molecular Modeling |
| 6 | Arithmetic of Chemistry and Pollution |
| 7 | Acids, Bases, Redox Reactions |
| 8 | Acids, Bases, Redox Reactions |
| 9 | Introduction to Organic Chemistry |
| 10 | Introduction to Organic Chemistry |
| 11 | Polymers and Materials Chemistry |
| 12 | Polymers and Materials Chemistry |
| 13 | Nuclear Chemistry & Technology and Impact on Society |
| 14 | Household Chemistry, Medicinal Chemistry and Impact on Society |
| 15 | Review for Final Exam |
| 16 | Final Exam Period |

II. Course Objectives*:

- A. Understand the fundamental concepts of atomic structure, molecular structure, and bonding. I.5
- B. Predict properties of elements from the periodic table based on an acquired knowledge of periodic law. I.5
- C. Apply the laws of chemistry and utilize the necessary mathematics to solve problems in chemical relationships. VI.2
- D. Understand the fundamental concepts of kinetic molecular theory. I.5
- E. Demonstrate knowledge of the nature and behavior of electrolytes. I.5
- F. Identify nuclear particles, balance nuclear equations, and distinguish between nuclear fission and fusion. I.5, VI.1
- G. Use appropriate computer technology and software to assemble, organize, and analyze

scientific data, models, and information via experiment or web-based searches. I.2, III.3, 5, V.4, VI.1,4,5, VII.1-4

*Roman numerals after course objectives reference goals of the university parallel program.

III. Instructional Processes*:

Students will:

1. Demonstrate problem-solving ability with emphasis on chemical word problems and perform mathematical calculations. *Problem Solving and Decision Making Outcome, Numerical Literacy Outcome*
2. Use appropriate methods and equipment for making chemical observation and measurements in a laboratory setting. *Technological Literacy Outcome, Numerical Literacy Outcome*
3. Collect data, generate and interpret chemical laboratory data using appropriate computer technology and/or software. *Technological Literacy Outcome, Numerical Literacy Outcome, Active Learning Strategy*
4. Locate, read, and interpret scientific information in printed media. *Communication Outcome, Personal Development Outcome, Information Literacy Outcome*
5. Learn and use chemical terms, name chemical compounds, understand and predict chemical behaviors. *Communication Outcome, Problem Solving and Decision Making Outcome*
6. Understand and communicate the relevance of chemistry to their chosen field of work and society in general. *Transitional Strategy*
7. Correlate laboratory observations with theoretical concepts presented in class. *Active Learning Strategy*
8. Read, analyze, and evaluate scientific writings and experimental procedures. *Communication Outcome, Cultural Diversity Social Adaptation Outcome*
9. Collect, organize, interpret, and publically present information concerning scientific events, subjects in society, and knowledge to students at PSTCC, and possibly in the community. *Communication Outcome*

*Strategies and outcomes listed after instructional processes reference Pellissippi State's goals for strengthening general education knowledge and skills, connecting coursework to experiences beyond the classroom, and encouraging students to take active and responsible roles in the educational process.

IV. Expectations for Student Performance*:

Upon successful completion of this course, the student should be able to:

1. Perform mathematical calculations pertaining to unit conversions, significant figures, quantitative chemical relationships, density, solution concentrations, dilutions, pH and pOH, hydronium and hydroxide ion concentrations, titrations, half-life of radioactive isotopes, gas laws, colligative properties. C
2. Understand the fundamental chemical concepts including atoms, subatomic particles, formation of ions, moles, molecules. A
3. Draw/build Lewis structures for the elements and compounds predict shape and polarity of

- covalent compounds. A, B, C
- Determine oxidation numbers, name compounds and write their formulas. A, C
 - Label bond type(s) for an element or compound and describe molecular type. A, D
 - Classify chemical reactions. A, C
 - Understand and recognize electrolytes and understand their behavior. A, B, E
 - Understand kinetic molecular theory and how it relates to gases, liquids, and solids. D
 - Understand the dissolution process and colligative properties. A, D, E
 - Understand and recognize the different acid-base theories, distinguish between strong vs. weak acids and bases and understand their reactions, and understand buffer solutions. A, B, C
 - Understand the concepts of chemical equilibria and chemical kinetics, and determine the equilibrium and rate constants. A, B, D
 - Identify nuclear particles and balance nuclear reactions. C, F
 - Understand radioactive decay of a nuclide and determine its rate of decay and half-life. A, F
 - Distinguish between nuclear fusion and fission. F
 - Develop an understanding of the scientific method and applications in chemistry and in everyday life. A
 - Classify and identify the types of polymers and other synthetic materials. A
 - Identify components and describe major environmental factors and processes that are ongoing on our planet. A, B, C, G
 - Understand and evaluate the chemical principles being utilized in the household and medicinal chemistry areas. A, G

*Letters after performance expectations reference the course objectives listed above.

V. Evaluation:

A. Testing Procedures: 45 % of grade

Unit tests: 30%

FOUR (4) tests will be given. One test may be dropped. There are NO MAKEUP Tests. Tests will be multiple choice, short answer, fill-in-the-blank, but mainly discussion/problem solving.

Comprehensive final exam: 15%

All students are required to take the final exam in order to receive credit for the course.

B. Laboratory Expectations: 40% of grade

- Attendance is required for scheduled lab meetings. There are NO MAKEUP Lab sessions. Students may drop the one, lowest lab grade of the semester. NOTE: if a student misses more than four lab sessions, the student receives an F for the course regardless of the

grade for the lecture portion. Lab report sheets must be completed in INK. Contact lenses may not be worn in the laboratory.

2. A comprehensive lab final will be given on the last day of lab, worth 5% of grade. This will consist of presentations of student-designed experiments/demos and discussions explaining a scientific concept either studied during the semester or one of student interest (with approval from the instructor). [See Section C.3 below.]

NOTE: This course will be activity/discussion-based; although “ lab” activities will mainly occur during the scheduled “ lab” section of the course, there will be activities during the “ lecture” section—there will be no makeup sessions for any activities missed.

C. Field Work: 15% of grade

NOTE: All activities in this section are intended to be included in your Portfolios begun in BIOL 1310.

1. The course will include several activities that necessitate the use of the Internet and various software programs that will be provided. Basic computer skills will be beneficial for completing these activities. Chemistry website evaluations will be performed to identify and critique the value of databases and other chemical information contained on the Web. (Worth ~3% of grade.)

2. Students will design, construct, and demonstrate two experiments or demonstrations for the class during the last lab session. This will count as the lab final (see Section V. B 2 above). One demo will be of an already existing experiment, and one that will be an original, student-designed experiment or demo. Details and suggestions will be given later.

3. A journal or collection of news articles (both from printed and broadcast media) pertaining to chemistry and chemical applications. Short synopses of appropriate articles will be collected over the course of the semester—advance notice will be given. A maximum of 25 possible bonus points will be awarded for the successful completion of this activity.

4. Homework Problems: Students are strongly encouraged to work all of the assigned problems. These are not graded assignments; students are expected to work them out on their own.

E. Grade Breakdown:

Summary of Assignments:

| | |
|-------------------|----------------------|
| Exams | 300 pts (30%) |
| Lab Expts. | 400 pts (40%) |
| Class Activities | 75 pts (7.5%) |
| Website Eval. | 25 pts (2.5%) |
| Expt/Demo Lab | 50 pts (5%) |
| <u>Final Exam</u> | <u>150 pts (15%)</u> |
| TOTAL | 1000 pts |

Grading Scale

| | |
|--------------|----|
| 90.0 - 100.0 | A |
| 87.5 - 89.9 | B+ |
| 80.0 - 87.4 | B |
| 77.5 - 79.9 | C+ |

70.0 - 77.4 C
60.0 - 69.9 D
Below 60.0 F

VI. Policies:

A. Attendance Policy:

Pellissippi State Technical Community College expects students to attend all scheduled instructional activities. As a minimum, students in all courses must be present for at least 75 percent of their scheduled class and laboratory meetings in order to receive credit for the course. Individual departments/programs/disciplines, with the approval of the vice president of Academic and Student Affairs, may have requirements that are more stringent.

B. Academic Dishonesty:

Plagiarism, cheating and other forms of academic dishonesty are prohibited. A student guilty of academic misconduct, either directly or indirectly through participation or assistance, is immediately responsible to the instructor of the class. In addition to other possible disciplinary sanctions that may be imposed through the regular Pellissippi State procedures as a result of academic misconduct, the instructor has the authority to assign an F or a zero for the exercise or examination or to assign an F in the course.

C. Other Policies:

Visitors:

Visitors are not allowed in the classroom or the laboratory.

Help:

Please e-mail the instructor or come to office hours if help is needed. Also students may obtain free tutoring at the Learning Center in 330 ERC (check schedule there).