

SOUTHERN CONNECTICUT STATE UNIVERSITY

CHE 121 - General Chemistry II

Spring Semester 2004

Tuesday, Thursday - 4:40 - 5:55 pm

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Office Hours:

Monday, Wednesday, Friday: 10:00 - 11:00 am

Tuesday: 2:00 - 4:00 pm

Or by appointment at other times

COURSE NUMBER CHE 121 **CREDIT HOURS:** 4 **PREREQUISITES:** CHE 120

COURSE TITLE: General Chemistry II

COURSE DESCRIPTION:

Physical properties of gases, liquids, solids and solutions. Study of reaction kinetics and development of rate law expressions. Examination of dynamic equilibrium, acid-base chemistry and buffer solutions. Study of thermochemistry and relationship to equilibrium situations. Practical applications of electrochemistry.

COURSE'S CONTRIBUTION:

CHE 121 is the second course in the general chemistry sequence. The course is a requirement for students pursuing the science education degree in chemistry. The course involves the further study of the fundamental principles of chemistry as they pertain to the understanding of physical and chemical properties of matter.

The course emphasizes analytical thinking and applications to problem solving using both quantitative and qualitative approaches. Students are expected to apply new concepts as well as those discussed in the prerequisite course (CHE 120) to curricular material. A working knowledge of algebra is required and knowledge of basic calculus is strongly suggested.

The qualitative aspects of the course involve the extension of basic atomic theory and application to the properties of matter that can be measured and assessed in every day life. Quantitative aspects of the course address the use and manipulation of established mathematical data and equations. Application of these equations requires an understanding of the underlying theories and the limitations that may be imposed by using such approaches. Both qualitative and quantitative approaches are used to develop critical thinking skills that can be extended to a wide variety of real life situations in an educational setting.

The laboratory experiments and problem sets are designed to place an emphasis on the key learning goals of the course. Laboratory conduct and practices are outlined and encompass an inquiry-based approach to learning, environmental concerns, safety in science instruction and methods for the creation of an appropriate learning environment. Experiments involve gathering and manipulating empirical data and relating outcomes to the theories discussed in lecture as well as assessing any limitations of the experimental approach.

LEARNER OUTCOMES & ASSESSMENT

1. Identify the intermolecular and intramolecular forces existing between molecules of a pure substance and relate these to the observed differences in physical properties. (INTASC 1, 4; NSTA 1, 3, 4, 7; CCCT 1.2, 1.3, 1.4, 2.2, 2.5)
2. Identify the effect of pressure and temperature on the physical states of matter with the use of phase diagrams and correlation to properties such as vapor pressure. (INTASC 1, 4; NSTA 1, 2, 3, 4; CCCT 1.2, 1.3, 1.4, 2.2, 2.5)
3. Understand the basic types of structure and bonding of matter in the solid state. (INTASC 1, 4; NSTA 1, 2, 3, 4; CCCT 1.2, 1.3, 1.4)
4. Use the close packing model of structures in the solid state to calculate properties such as the density of solids, bond distances in solids, number of molecules in the unit cell and the percent of empty space. (INTASC 1, 4; NSTA 1, 2, 3; CCCT 1.3, 1.4, 2.2, 2.5)
5. Understand the solution process and correlation to thermodynamic properties based on intermolecular and intramolecular forces. (INTASC 1, 4; NSTA 1, 2, 3, 4; CCCT 1.2, 1.3, 1.4)
6. Perform calculations and conversions based on different concentration units for solutions. (INTASC 1, 4; NSTA 1, 2, 3, 4; CCCT 1.2, 1.3, 1.4, 2.2, 2.5)
7. Identify the factors affecting solubility of substrates in solution and calculations based on limits of a saturated system. (INTASC 1, 4; NSTA 1, 2, 3, 4; CCCT 1.3, 1.4, 1.6, 2.5)
8. Identify types of colligative properties of solutions and perform calculations based on boiling point elevation, freezing point depression and vapor pressure lowering. (INTASC 1, 4; NSTA 1, 2, 3, 4, 7; CCCT 1.3, 1.4)
9. Develop expressions for reaction rates based on tables of kinetic data. (INTASC 1, 4; NSTA 1, 2, 3, 4; CCCT 1.3, 1.4, 1.6)
10. Correlate the effect of solution concentration and temperature on the rate of reactions. (INTASC 1, 4; NSTA 1, 2, 3, 4; CCCT 1.2, 1.3, 1.4, 2.2, 2.5)
11. Postulate reaction mechanisms based on kinetic data and identify the effects of catalysis from a thermodynamic perspective. (INTASC 1; NSTA 1, 2, 3, 4, 7, 10; CCCT 1.2, 1.3, 1.4, 1.6)
12. Understand the general concepts of solution equilibrium and the calculation of equilibrium constants. (INTASC 1, 4; NSTA 1, 2, 3, 4, 7; CCCT 1.2, 1.3, 1.4, 2.2)
13. Use LeChâtlier's principle to qualitatively and quantitatively demonstrate the effect of perturbations to a solution in equilibrium. (INTASC 1, 4; NSTA 1, 2, 3, 4, 7; CCCT 1.3, 1.4, 1.6, 2.2, 2.5)
14. Relate the concept of equilibrium to solutions of weak acids and bases and calculations of pH, pK_a and pK_b . (INTASC 1, 4; NSTA 1, 2, 3, 4; CCCT 1.2, 1.3, 1.4, 2.2)
15. Understand the common ion effect and the relationship to buffer solutions. (INTASC 1, 4; NSTA 1, 2, 3, 4; CCCT 1.2, 1.3, 1.4, 2.2)
16. Calculate the pH of buffer solutions and intermediate solutions in the titration of acids and bases. (INTASC 1, 4; NSTA 1, 2, 3, 4; CCCT 1.2, 1.3, 1.4, 1.5, 1.6, 2.2)
17. Apply the concept of equilibrium to solution solubility and the precipitation and separation of ions for qualitative analysis of unknown solutions. (INTASC 1, 4; NSTA 1, 2, 3, 4; CCCT 1.3, 1.4, 2.5)
18. Apply the equilibrium concept to spontaneous processes and correlation with thermodynamic quantities. (INTASC 1, 4; NSTA 1, 2, 3, 4; CCCT 1.3, 1.4)

19. Understand the concepts related to the operation of voltaic cells and calculations of cell electromotive force. (INTASC 1, 4; NSTA 1, 2, 3, 4, 7; CCCT 1.3, 1.4)
20. Utilizing the cell potential in voltaic cells to determine the spontaneity of redox reactions. (INTASC 1, 4; NSTA 1, 2, 3, 4; CCCT 1.2, 1.3, 1.4, 2.2)
21. Understand the composition commercial voltaic cells, electrolysis, and corrosion prevention. (INTASC 1, 4; NSTA 1, 2, 3, 4, 7; CCCT 1.3, 1.4, 2.5)
22. Understand basic rules for naming organic compounds and identifying structure based on functional group identification. (INTASC 1, 4; NSTA 1, 2, 4; CCCT 1.3, 1.4)
23. Relate the chemical concepts learned in class to experimental data obtained in the laboratory. (INTASC 1, 4; NSTA 1, 2, 3, 4, 5, 6, 7, 9, 10; CCCT 1.2, 1.3, 1.4, 1.5, 1.6, 2.2, 2.5, 2.6)

MODES OF LEARNING

Class lecture and discussion; problem solving; experimentation. Recitation sessions are voluntary and are conducted on Saturdays at a time to be announced.

COURSE CONTENT OUTLINE

	Topic	Assigned Reading
Lectures 1-4	Liquids, Solids, and Phase Changes	Ch. 10
Lectures 5-7	Solutions and Their Properties	Ch. 11
Lectures 8-10	Chemical Kinetics	Ch. 12
Lecture 11	Exam #1 Chapters 10 and 11	
Lectures 12-14	Chemical Equilibrium	Ch. 13
Lectures 15-17	Aqueous Equilibria: Acids and Bases	Ch. 15
Lecture 18	Exam #2 Chapters 12 and 13	
Lectures 19-21	Applications of Aqueous Equilibria	Ch. 16
Lectures 22-24	Thermodynamics: Entropy, Free Energy, and Equilibrium	Ch. 17
Lecture 25	Exam #3 Chapters 15 and 16	
Lectures 26-28	Electrochemistry	Ch. 18
Lecture 29	Organic Chemistry	Ch. 23

REQUIRED TEXTS

1. *Chemistry, Fourth Edition* J. McMurray, R. C. Fay, Prentice-Hall (2004) ISBN: 0-13-140221-8
2. *Catalyst, The Prentice Hall Custom Laboratory Manual*, Pearson Custom Publishing (2002) ISBN 0536711011

RECOMMENDED TEXTS

1. Study Guide, *Chemistry, Fourth Edition* D. Fredeen, Prentice-Hall (2004) ISBN:0-13-
2. Solutions Manual, *Chemistry, Fourth Edition* J. Topich, Prentice-Hall (2004) ISBN: 0-13-

COURSE REQUIREMENTS

Students will be expected to read the appropriate sections of the text prior to classroom lectures. Students are also expected to attempt sample problems found at the end of each chapter in order to prepare for quizzes and tests. Assignments involving qualitative and quantitative approaches to problem solving will be distributed in class and will be available on the instructor's homepage. The questions contained in assignments and sample tests are commensurate with the degree of difficulty that can be expected for the quizzes and examinations. In addition, the sample tests are designed to provide the student with an idea of the duration of the examination and the breadth and depth of curricular material to be evaluated. Solutions to problems will be posted on the wall-mounted case outside the instructor's office.

There will be three term tests of which the lowest grade will be dropped. A series of problem sets and in class quizzes will be given during the term. The best ten grades will be counted. The final examination is cumulative and the date and time will be announced in class and posted on the instructor's homepage. Assignments, quizzes, and sample tests are posted on the instructor's homepage and are updated in a regular fashion.

(<http://www.southernct.edu/~lesley/Homepage/index.html>) Quizzes will be given in class toward the end of the scheduled lecture time.

Students are required to complete ten laboratory exercises in addition to completing the initial safety training and check-in/check-out procedures. Any student who has not completed the safety training will not be permitted to participate in the laboratory exercises. It is the policy of the Chemistry Department at Southern Connecticut State University that, to receive a passing grade for CHE 121, you must receive a passing grade for the laboratory portion of the course. A passing grade for the laboratory portion of the course is 60%. The individual laboratory instructor for the section you have registered in will distribute the evaluation criteria for the laboratory portion of the course.

EVALUATION CRITERIA

Best 2 of 3 Term Examinations	40%
Best 10 Assignments / Quizzes	10%
Laboratory Grade	25%
Final Examination	25%

	100%

The following final grade scale will be used:

A+ = 96 - 100%
A = 91 - 95%
A- = 86 - 90%
B+ = 82 - 85%
B = 78 - 81%
B- = 74 - 77%
C+ = 70 - 73%
C = 66 - 69%
C- = 62 - 65%
D+ = 58 - 61%
D = 54 - 57%
D- = 50 - 53%
F = ≤ 49

The instructor reserves the right to adjust the grading scales for class average at the end of the semester.

STANDARDS GUIDELINES

INTASC [Interstate New Teachers' Assessment & Support Consortium]

Scholarship

1. Knowledge of subject matter
2. Knowledge of human development & learning
3. Instruction adapted to meet diverse learners
4. Use of multiple instructional strategies & resources

Attitudes and Disposition

5. Effective learning environment created
6. Effective communication
7. Lesson planning

Integrity

9. Reflection and professional development

Leadership

8. Assessment of student learning to improve teaching

Service

10. Partnership with school and community

Professional Standards

National Science Teacher's Association

1. Content - Structure and interpret the concepts, ideas and relationships in science
2. Nature of Science - Define the values, beliefs and assumptions inherent to the creation of scientific knowledge within the scientific community
3. Inquiry - Formulating solvable problems, constructing knowledge from data, exchanging information for seeking solutions, developing relationships from empirical data
4. Context of Science - Relate science to daily life: technological, personal, social and cultural values.
5. Skills of Teaching - Science teaching actions, strategies and methodologies, interaction with students, effective organization and use of technology.
6. Curriculum - Extended framework of goals, plans, materials and resources for instruction.
7. Social Context - Social and community support network, relationship of science to needs and values of the community, involvement of people in the teaching of science.
8. Assessment - Alignment of goals, instruction and outcomes, evaluation of student learning.
9. Environment for Learning - Physical spaces for learning, psychological and social environment, safety in science instruction.
10. Professional Practice - Knowledge and participation in the professional community, ethical behavior, high quality of science instruction, working with new colleagues as they enter the profession.

CCCT {CONNECTICUT COMMON CORE OF TEACHING}

DEMONSTRATIONS OF KNOWLEDGE

- 1.1 understanding of student learning & development
- 1.2 understanding of need for different learning approaches
- 1.3 proficiency in reading, writing and mathematics
- 1.4 understanding of central concepts & skills, tools of inquiry and structures of discipline(s)
- 1.5 knowledge of how to design and deliver instruction
- 1.6 recognition of need to vary instructional methods

APPLICATION OF KNOWLEDGE THROUGH

- 2.1 instructional planning based upon knowledge of subject, students, curriculum & community
- 2.2 selection and/or creation of learning tasks that make subject meaningful for students
- 2.3 establishment and maintenance of appropriate behavior standards and creation of positive learning environment
- 2.4 creation of instructional opportunities supporting students' academic, social and personal development
- 2.5 use of verbal, nonverbal and media communication fostering individual and collaborative inquiry
- 2.6 employment of various instructional strategies in support of critical thinking, problem solving and skills demonstration
- 2.7 use of various assessment techniques to evaluate student learning & modify instruction

DEMONSTRATION OF PROFESSIONAL RESPONSIBILITY THROUGH:

- 3.1 professional conduct in accordance with the Code of Professional Responsibilities for Teachers
- 3.2 shared responsibility for student achievement and well-being
- 3.3 continuous self-evaluation regarding choices & actions on students and school community
- 3.4 commitment to professional growth
- 3.5 leadership in the school community
- 3.6 demonstrations of a commitment to students and a passion for improving the profession

TENTATIVE COURSE CALENDAR
See "Course Content Outline" above.

DISABILITY ACCOMMODATION STATEMENT

As a student with a disability, before you receive course accommodations, you will need to make an appointment with the Disability Resource Office located in EN 15 to arrange for approved accommodations. However, if you have other information you would like to speak with me about, if you have emergency medical information to share with me, or if you need special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible. My office is located in Jennings Hall (JE 308) and my office hours are listed on the first page. Every effort will be made to accommodate students in this course.

ADDITIONAL COMMENTS

Additional Resources:

The following sites contain tutorial materials and practice problems.

<http://www.cw.prenhall.com/bookbind/pubbooks/mcmurry2/>

<http://www.chem4kids.com>

<http://www.chemfinder.cambridgesoft.com>

<http://www.chemspy.com>

<http://www.chemicalelements.com>

The instructor has prepared a set of course notes that will be used during lectures. These will be made available from the reserve desk at the Buley Library under the instructor's surname. These materials have been provided to aid students with taking notes during lecture since the pace is often quick. It is recommended that students make copies of these materials since the instructor will not delay the lecture to wait for students to finish writing materials.

Missed/Late Work:

Assignments and laboratory reports are due at the beginning of the scheduled meeting time. Late or missed tests, assignments, and quizzes will receive a grade of zero except in the case of substantiated illness (a doctor's note is required). A student must inform the instructor prior to the evaluated exercise in order to receive consideration. Laboratory reports will be deducted 5% per day (excluding weekends and holidays) if they are not submitted at the scheduled time up to a maximum of 14 days at which time a grade of zero will be assigned. There is no extra credit nor make-up examinations given that the lowest test grade and at least three of the lowest assignment/quiz grades will be dropped. Failure to complete more than one laboratory exercise will result in a grade of zero for the course. Missed laboratory exercises may be completed at another session, during the same scheduled week of class, only if granted permission by the course instructor. In this case, a signed permission slip must be obtained from the instructor in order to gain entry into a different section of laboratory.

Inclement Weather:

Official information regarding class cancellations or delays can be obtained from the university WeatherChek voice mail system at 203-392-SNOW. If a scheduled examination, quiz or assignment is postponed due to weather it is assumed that the exercise will be rescheduled to the next available classroom session.

Attendance:

Regular and prompt attendance of scheduled classes is not mandatory but is strongly recommended to achieve success in this course. Prompt attendance for laboratory sessions is required. Students arriving late to laboratory sessions will not be able to participate in the preliminary discussion and will not be allowed to complete the exercise.

Cell Phones:

All cell phones and pagers must be turned off during lecture and laboratory. Students who ignore this policy will be asked to leave the classroom or laboratory and will receive a grade of zero for all evaluations to be carried out during that time. If you are on call for work related emergencies or personal reasons please switch all devices to a mode that will not disturb the class (i.e. vibrate mode) and inform the instructor prior to class.

Academic Dishonesty:

Cheating on exams, laboratory reports, quizzes, and assignments will not be tolerated in this class. All students are expected to behave according to the code of conduct outlined in the student handbook. Apparel such as baseball caps that conceal your eyes during examinations will not be permitted. Programmable calculators will not be permitted unless you make prior arrangements with the instructor to demonstrate that all memory functions are free of equations or other information. Strict disciplinary action will be taken if these rules are not followed!