

SYLLABUS

CHEMISTRY 106[P]

SPRING 2007

LECTURE: MW 10:25 – 11:50
VMC 6

LABS: You must be enrolled in a CHEM 106[L] Section.
Tutorials meet every week. See web information (Blackboard)
for locations and times for lab and tutorial sections.

INSTRUCTOR: Dr. John Harrison **OFFICE:** 230B ELS **PHONE:** 546-9459 **EMAIL:**
harrisoj@vancouver.wsu.edu

OFFICE HOURS: Monday and Wednesday 1:00-2:30

LAB INSTRUCTOR:

Dr. Gene Schaumberg **OFFICE:** 208 ELS **PHONE:** **EMAIL:** tschaumberg@msn.com

SIP INSTRUCTOR: Steven Gresswell **EMAIL:** sdgress1@juno.com **GROUP MEETING:** TBA
<http://www.vancouver.wsu.edu/ss/src/sit/index.html>

SCIENCES PROGRAM OFFICE: 230 Engineering and Life Sciences Bldg. 546-9620

COURSE DESCRIPTION: Second semester general chemistry for science and engineering majors is a General Education course, and as such fulfills **GENERAL EDUCATION REQUIREMENTS** for Physical science (P) and laboratory (L).

COURSE OBJECTIVES: This course will introduce the student to basic principles and concepts of chemistry. Material will be presented in both a *content-based* and a *hands-on laboratory format*. Topics will include chemical kinetics, chemical equilibrium, solution properties, acid-base reactions, thermodynamics, redox reactions, electrochemistry, and nuclear chemistry. Students will work independently and in groups to gain understanding of the scientific method including experimentation and data interpretation involving chemical systems.

CHEM 106[P] directly addresses the 2006 WSU Vancouver Campus Theme, *Global Change in a Local Context*. As we study fundamental chemical concepts we will explore the relationship of chemistry to environmental, social, and cultural change. CHEM 106[P] also directly addresses several of WSU's learning goals, including: *critical thinking, quantitative and symbolic reasoning, and communication*. This course *links to other GER courses*, specifically Biology 107 and GE 105 & 106, Land, River, Sea: People and the Watershed.

INTERNET: Class website = <http://www.blackboard.wsu.edu/>
To Login: username = your internet ID#
Password = WSU ID#

If you don't know your internet ID and WSU ID numbers go to <http://www.vancouver.wsu.edu/vis/vit/vithome.html> or contact the Information Technology Help Desk in room ITB2091, send an email message to helpdesk@wsu.edu or call 509-335-0522.

PREREQUISITES (you can not take this class if you don't meet the following requirements)

- Math 107 with a C or better or placement into Math 140 or higher. Math 103 or lower does not meet requirement.
- CHEM105, CHEM 115, with a grade of C or better, or equivalent

TEXT: Chemistry the Molecular Science by Moore, Stanitski, and Jurs, Thomson-Brooks/Cole, 2nd Ed. (2005)

ISBN: 0-534-42201-2 (required)

LAB TEXT: General Chemistry Laboratory Manual, Place and Weissbart, Star Publishing, (2004) (required)

LAB NOTEBOOK: Carbon-copy with numbered pages (required), available at campus bookstore.

GOGGLES: Required by State Law, available at campus bookstore

LABORATORY COAT: recommended, available at campus bookstore

LECTURES: Lectures must be attended on a regular basis. Quiz and exam questions are based partially on lecture material. You will be expected to read the textbook and study the example problems BEFORE coming to class. The lecture will supplement and clarify the information from your text rather than reiterate it.

EXAMS: There will be three “mid-term” exams and a comprehensive final. These exams will be given *Wednesdays in class* during the week indicated on the schedule. All exams are multiple-choice. You are responsible for bringing a calculator and a pencil to all exams. You may use a periodic table and a single 3”x 5” card with *hand-written* notes for the quizzes. Missing an exam will only be excused for medical reasons. All make-up exams will be given during the 15th week of the semester. If you know you will be missing an exam for academic reasons you may arrange with the instructor to take it early.

QUIZZES: Take-home quizzes will be given on *Wednesdays without exams* and will cover lecture and homework material through the assignment due the previous Wednesday. There will be 11 quizzes of which you may drop 2. There will be no make-up quizzes.

HOME WORK: There are weekly homework assignments through week 15. Homework will be due at the start of lecture on the following *Monday*. It should be placed in the box designated for your lab section. *Late homework assignments will not be accepted.* For two questions from each assignment, the correct answer must be obtained to get full credit. For the rest of the questions, credit will be given for a complete attempt. All work must be legible and conform to normal standards for written English. Homework answers must be *hand-written* and all work shown. The pages must be stapled together and each page headed with your name, lab section, and lab instructor’s name. Quiz and exam questions will be modeled on homework questions. Answer keys to the homework will be posted by 5PM of the day the assignment is due. A maximum of 100 points will be possible from the 10 highest scoring homework assignments. Quizzes and exams are based partially on homework questions.

GRADING		GRADE RANGES (max cutoff)	
3 exams	300 points	900 points	A
11 tutorial quizzes (best 9)	180	800	B
13 homework set (best 10)	100	700	C
10 laboratory experiments	180	600	D
1 Formal lab report	40	<600	F
Final Exam	200		
Total	1000		

TUTORIALS: These are small classroom meetings associated with your lab section and lead by your lab instructor. Students who miss tutorial will not be allowed into the lab. Tutorials are interactive problem solving sessions driven by your questions. Bring your text, lab manual, and calculator to the tutorial. Pre-labs and lab reports are due at the *start* of tutorial. Help with pre-labs and lab reports will not be available in tutorial as they must be completed *before* attending.

LABORATORIES: You must be enrolled in a lab section, CHEM 106[L]. The laboratory must be both attended and passed as this is a Laboratory GER course. Failing the lab portion of the course will result in a failing grade for the course. Obtaining a zero on more than 2 experiments will result in an F for the course.

- **OBJECTIVES:** Students will gain experience with hypothesis development and testing, observation, experiment theory, data analysis, interpretation of experimental results, and technical communication.
- **PRE-LABORATORY ASSIGNMENTS:** Pre-laboratory assignments are due at the start of the tutorial. Students who fail to submit a complete pre-lab assignment at this time will not be admitted to lab that week and will receive a score of zero for that experiment. Students who miss an experiment for this reason will not be allowed to arrange a make-up lab or to submit a lab report for half credit.
- **LABORATORY PROCEDURE:** Students will work in pairs for each experiment. Each student is expected to record all data and observations for each experiment directly into their own lab notebook. Data may not be recorded on loose paper and later transferred to the notebook. Submission of identical data by 2 or more students who are not assigned to be lab partners will be considered cheating. You are required to get your lab instructor's signature on your data and calculations before you leave lab. Failure to do so will result in zero credit for that experiment.
- **LABORATORY DRESS CODE:** For your safety, a strict dress code will be enforced in the lab. Failure to comply with the dress code will result in expulsion from the lab and a score of zero for that experiment. You must be fully clothed from head to toe. No shorts, short skirts, sandals or open-toed shoes are permitted. Short sleeves are acceptable, but sleeveless garments are not. The purchase and use of a lab coat will adequately cover the upper body, but legs, ankles, and feet must be covered by your street clothes.
- **LABORATORY REPORTS:** CHEM 106 is a *General Education Course*, and as such, has significant writing assignments in the form of lab reports in which students will identify questions, gather data, analyze data and propose solutions to each experiment. Lab reports will normally be due at the start of the following week's tutorial. Failure to submit a lab report for an experiment will result in zero credit for that experiment. The format for lab reports is described in the Lab Manual. One *Formal Lab Report* will be required and must be submitted to your *Electronic Portfolio*. The format for the Formal Lab Report will be discussed by your lab instructor.
- **MAKE-UP LABS:** Labs missed for reasons beyond your control may be made up at the discretion of the lab instructor, on a space available basis, in the same week that the lab is missed. If make-up space is not available, a report may be written from data supplied by the lab instructor. Such reports are due at the normal time and will be worth no more than half credit. Only 2 lab make-ups are allowed per semester. We can not guarantee make-up space will be available.
- **ADJUSTMENTS TO LAB SCORES:** The instructor will make every effort to ensure that the grading of lab reports is consistent and fair. To this end, the instructor reserves the right to normalize the lab scores from different lab instructors to the same average. This adjustment will be made at the end of the semester after all scores have been submitted.

ATTENDANCE POLICY: Attendance of lab sessions is mandatory. Attendance of lectures is not.

E-COMMUNICATION: All email communication to instructors should contain the words CHEM 106 in the subject line.

CALCULATORS: You are expected to have and to be able to use a scientific calculator. Graphing calculators are allowed but not required. The use of any stored information/programs in a programmable calculator will be considered cheating. Calculators with a full QWERTY keyboard; PDA's, palmtop, laptop, and hand-held computer, and cell phone/calculators may not be used during

quizzes and exams. You are responsible for bringing your calculator to all tutorials, lectures, labs, and exams.

STUDENT COMPUTING LABS: Computers are available for student use in MMC 101, CLS 218, and LIB 102. Hours and other information can be found on the web site:

<http://www.vancouver.wsu.edu/vis/vit/labs.html>

POLICY ON LATE (OR EARLY) ASSIGNMENTS:

- Lab reports: Late lab reports will be penalized by the loss of 2 points per day (or portion thereof). Reports submitted after the start of tutorial are considered a day late. This penalty is applied after the normal grading of the report. Reports submitted more than one week late will receive zero points. No reports will be accepted after 5:00PM on the last day of classes (April 27, 2006).
- Homework assignments: Late homework assignments will not be accepted for any reason.
- Early submission: If you know that you will not be present at the time a lab report or homework assignment is due, they may be submitted early without penalty. Submissions may be made directly to the instructor, lab instructors, or to the Sciences Program Office, Room 230 ELS.

CLASSROOM ETIQUETTE: During class please don't talk, read the paper, catch up on sleep, or work on assignments. Cell phones and pagers must be turned off.

ACADEMIC INTEGRITY: Students are largely on the honor system. However, cheating or plagiarism in any form is not acceptable. Cheating includes, but is not limited to: copying work or allowing your work to be copied; use of unauthorized material during quizzes and exams; any communication between students during quizzes and exams; actively looking at another student's paper during a quiz or exam. Students repeating the course must rework and rewrite all assignments. Plagiarism includes resubmitting previously graded homework or lab reports from a previous semester, even if they were your own work. Plagiarism also includes using laboratory data from another person or a previous semester. All occurrence of cheating may be reported to the Office of Student Affairs. The first incidence of cheating will result in a score of zero for the assignment, quiz, or exam in question. A second incident will result in an F for the course and possible dismissal from the University. For more information see <http://www.wsulibs.wsu.edu/plagiarism/main.html>.

ACCOMMODATIONS: Reasonable accommodations are available for students who have a documented disability. Please notify the instructor during the first week of class of any accommodations needed for the course. Late notification may cause the requested accommodations to be unavailable. All accommodations must be approved through Disability Services (VMMC 24, 546-9567, <http://www.vancouver.wsu.edu/ss/disability.htm>).

COPYRIGHT POLICY: WSU requires all users of campus services to comply with all state and federal laws including copyright laws. For more information see <http://publishing.wsu.edu/copyright/>

STUDENT CONDUCT: WSU, a community dedicated to the advancement of knowledge, expects all students to behave in a manner consistent with its high standards of scholarship and conduct. Students are expected to uphold these standards both on and off campus. When students violate the standards of conduct established by the university, they are subject to university disciplinary process as defined in the Student Handbook. Violations of the academic integrity standards, as defined in the Student Handbook, also subject students to university disciplinary process. For more information see <http://www.vancouver.wsu.edu/ss/handbook/handbook.html>.

WEATHER POLICY: For emergency weather closure policy see <http://www.vancouver.wsu.edu/adm/fo/psafety/weather.htm>

EVACUATION POLICY: Emergency evacuation plans are posted in each classroom. Read and be familiar with these plans. In case of emergency follow these instructions.

DISCLAIMER: This syllabus is a work-in-progress and is subject to change during the semester. Any changes will be announced in class.

Chemistry 106 and the WSU Learning Goals

The Chemistry 106 syllabus has been structured to reflect the fact that Chemistry 106 explicitly addresses the following learning goals: 1) Critical Thinking, 2) Quantitative and Symbolic Reasoning, and 3) Communication. I have also begun working towards increased linkages between Chemistry 106 and other, related courses (e.g. Bio 107). In the paragraphs that follow, I describe how the Chemistry 106 curriculum will link to the campus theme and address WSU's learning goals.

Linking to the Campus Theme

Chemistry 106 is directly relevant to the campus theme-*global change in a local context*-in several ways. First, lecture content will expose students to globally important environmental concerns such as acid rain, stratospheric ozone depletion, global changes in the nitrogen, phosphorus and carbon cycles, water quality degradation, and the production of smog. The role of individuals in contributing to these issues will be explored through the lens of chemistry. For example, students will be shown, using basic chemical principles, how the use of a catalytic converter on their car reduces the environmental impact of fossil fuel combustion. They will explore why the formation of N_2 , CO_2 , and water is preferable to alternative products of fossil fuel combustion, which cause smog and acid rain. The role of CO_2 in global climate change will also be explored. Students will also be exposed to the chemistry behind fertilizer production, a process with striking global implications for the way natural and agricultural systems function. Where it makes sense, these and other globally relevant examples will be used to introduce and explore fundamental chemical principles including: chemical equilibrium, chemical kinetics, acid-base chemistry, solution properties, thermodynamics, redox reactions, and nuclear chemistry. In addition to their exposure to these ideas in lecture, students will be required to further explore their role as agents of chemical change at the local, regional and global levels in the laboratory setting.

Critical Thinking

Critical thinking is evidenced by the ability to use knowledge, claims of evidence, and context to reason ethically and reach conclusions as well as to innovate in imaginative ways. Students will develop these capacities in Chem 106 both through content-based and hands-on, laboratory-based approaches. In homework problems, quizzes, and exams, students will be required to marshal information they gain through lectures, reading, and lab experience to evaluate multiple approaches and answer complex questions. Students will also be given experience defining questions and their contextual boundaries by carrying out question-driven laboratory analyses. They will be asked to identify and define key concepts that are the foundation for a line of reasoning. They will be required to select and evaluate evidence as appropriate to the questions they are attempting to address. They will need to distinguish between fact and opinion, identify and apply relevant causal relationships, explanations, and theory for addressing the problem. They will also need to be able to identify contradictions and faulty logic, and evaluate possible alternative perspectives, explanations, and solutions. One example of a lab procedure where all of these skills will be brought to bear is the quantitative analysis experiment that students will carry out early in the semester. In this multi-week experiment, students will be required to define the properties of various anions and cations using a number of extraction and identification techniques. Then, once they are comfortable determining which compounds behave certain ways, they will be asked to identify unknowns of increasing complexity. This exercise will first give students the tools to reason and then ask them to apply those tools in a new context. They will also have to use multi-step logical reasoning to rule out alternative hypotheses and determine the identity of unknowns. As such,

this experiment will enhance student capacity for critical thinking, and the performance of students on this assignment will reflect their ability to think critically.

Quantitative and Symbolic Reasoning

Quantitative and symbolic reasoning ability is reflected in the ability of students to draw inferences and communicate appropriately using mathematical and symbolic concepts. Students in Chemistry will be required to demonstrate quantitative and symbolic reasoning by solving and checking answers to mathematical problems to determine reasonableness, identifying alternatives, and selecting optimal results. They will also be required to use available technology and tools such as computers, scientific calculators, and pencil and paper to apply quantitative and symbolic methods to solve problems. In addition, through homework problem sets, laboratory reports, take-home quizzes, and in-class exams students will be asked to draw conclusions from computational and symbolic representations in order to check the logic and validity of statements and models.

Communication

The communication learning goal stipulates that students should be able to write, speak, and listen well enough to achieve intended and meaningful understanding. Chemistry 106 is designed to achieve this learning goal in several respects. First, students will be asked to express concepts, propositions and beliefs in coherent, concise and technically correct form. They will have to choose the appropriate communication medium to express their results. In-class question and answer sessions will encourage students to hone their speaking and active listening skills, as will participation in group-based laboratory sessions. These laboratory sessions, carried out in pairs or groups of three will necessitate that students learn to follow social norms for individual and small group interactions. One of these lab reports will be submitted to the students' e-portfolio.

Linking to other courses

I will explore the possibility of exchanging lectures with Dawn Banker of Bio 107. Ideally, she will teach a class on biochemistry in Chemistry 106, and in turn I will give a lecture on global biogeochemical cycles in hers. This will successfully initiate the cross-linking of two General Education science courses. In addition to this formal linkage to Bio 107, many concepts will be introduced in Chemistry 106 that link it directly to GE 105 & 106, Land, River, Sea: People and the Watershed. In Chem 106 I will address how humans are affecting air and water quality through a number of different mechanisms that illustrate fundamental chemical principles. This will inform students approach to their study of humans within watersheds. Further opportunities for cross-linking courses will be explored in subsequent years.