

**CHEMISTRY 5**  
**Chemistry for Nurses**  
**SPRING, 2009**

***Instructors:***

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***Meeting times:***

Lecture section 1	MW 2:00-3:15 pm; F 2:00-2:50 pm	Sequoia Hall, 456
Lab section 2	R 12:30-3:30 pm	Sequoia Hall, 444
Lab section 3	F 8:30-11:30 am	Sequoia Hall, 444

***Text:*** *General, Organic, and Biological Chemistry, an integrated approach.* Kenneth Raymond. Wiley Publishing. ISBN 0-471-44707-2. You will also need to purchase WileyPlus, which is the on-line class component for homework and grading. You may also purchase the on-line text along with WileyPlus instead of the hardcopy text, at a considerable cost reduction.

***Course Description***

A one-semester chemistry survey course for pre-nursing students, covering the areas of general chemistry, organic chemistry and biochemistry. Major lecture topics include atomic and molecular structure and bonding, nomenclature of relevant inorganic and organic compounds, states of matter and intermolecular forces, solutions and solubility, reactions of inorganic, organic, and biological molecules, stereochemistry, structure and function of biological macromolecules, nutrition and metabolism. The course will emphasize chemistry as it appears in a practical nursing context. Lecture, four hours. Lab, two and a half hours. Prerequisite: One year high school algebra, high school chemistry strongly recommended. 5 units.

***Course Philosophy and Expectations***

What profession could be more important than nursing? Nurses provide direct patient care and are the front-line health-care providers for almost all of us. Chemistry plays a central role in nursing, since the functions of the body are all explained and understood by fundamental chemical concepts. This course was developed partly to stream-line the pre-nursing requirements, but more importantly to provide pre-nursing students with a context-based chemistry experience. We have worked hard to focus on the aspects of chemistry that nurses need the most, and to present this material as much as possible in a nursing context. The labs and case studies in particular are geared towards nursing related situations. Because we are trying to cover so many areas of chemistry in one semester, this course covers a very large amount of material in a short period of time and consequently requires **a lot of work outside of class**. In addition to the approximately 7 hours/week you will spend in lecture and lab, you should

plan on spending an additional 15 hours **minimum** outside of class studying and doing problems. That's right, *15 hours minimum*. The material in this course will move very, very fast and you will struggle mightily if you get behind. Because we believe nursing is a highly demanding, critically important profession, we are completely committed to the success of students in this class and we will do everything we can to help you. We expect you will bring a similar serious and hard-working attitude to the class. **If you feel you are not prepared to work long hours studying for this course, you should consider dropping the course now and taking it some other time.**

The main course components are as follows:

- 4 hours of lecture/week. This is where we will introduce fundamental chemistry concepts, linking these concepts as much as possible to nursing situations. We will do some problem-solving in lecture to help you understand the concepts we are introducing. We will evaluate your progress through three mid-terms and a comprehensive final exam.
- 3 hours of lab/week. The laboratory is where we will explore the concepts in hands-on real-life applications. We will also do some case studies during lab to further assist you in understanding the connection between chemistry and nursing practice. Your progress will be evaluated through your performance on pre-labs, post-labs and case studies.
- Homework. Homework is critical to success in any science class, especially chemistry. You will be assigned homework to do each week and we highly recommend you work on it every day. Homework will be assigned on a weekly basis and graded through the on-line program WileyPlus.

We have a big challenge in this course, which is to help you learn the chemistry you need to become excellent nurses in a very short amount of time. We don't have time to waste on tardiness and absences. Although we understand there are always unexpected situations that come up in life, if you feel your situation this semester is such that you are anticipating problems with attendance, **you should drop the course now and take it some other time.** Having said that, we also need to point out that this semester is the first offering of this class, which is a novel and challenging approach to chemistry for nurses. We expect many issues will crop up as we go along, and there are likely to be changes to the syllabus along the way. We will do everything we can to alert you to these changes as soon as we encounter them. We will also take any changes into account and adjust grades accordingly, if needed. Above all, we will be very, very fair in assigning the final grades. We realize this is an experimental course and you are the first students to try it out. We will continuously keep that in mind as we go through the semester.

### *Assignments*

**Quizzes:** Quizzes will be given each Wednesday in lecture at the beginning of class and will cover the material for the previous week. **There are no makeups on quizzes, if you miss a quiz, even for a valid reason, it will count as a zero.** The three low scores will be dropped at the end of the semester.

**Exams:** There will be 3 exams and one comprehensive final exam. The 3 exams will be a ~50:50 mixture of multiple choice and short answer questions. The final exam will consist entirely of multiple choice questions.

**Homework:** Weekly online homework will be assigned using WileyPlus. This homework must be completed by the deadline, or it will count as a zero. To register for WileyPlus, go to

www.wileyplus.com, enter the URL address we will give you in class, and follow the 2 minute tutorial on registering. Additional information will be given during the first week of classes.

**Prelab assignments:** Prelab assignments will consist of either questions in the lab manual that must be answered **before** you come to lab, or a short prelab quiz. Failure to complete the prelab questions **before** lab begins will result in your dismissal from lab that day. You will then be required to make up the experiment in another section (with instructor approval).

**Lab reports:** Lab reports are due at the beginning of lab (before the prelab lecture). Late lab reports will be subject to a 10% penalty per day late, and will not be accepted once the graded reports have been returned.

### ***Make-up policy***

**Exams** can only be made up if the student presents a legitimate verifiable excuse such as a police accident report or a doctor's note. Work situations are not included! If your work schedule is going to interfere with exams or assignments, **you should drop the course now and take it some other time.** This same advice applies family situations. If you have a demanding family situation that will interfere with your attendance and ability to show up for exams, we suggest you take this course some other time.

**Homework** cannot be made up. It is due at the assigned time.

**Labs** can be made up either the week of absence or the week immediately following the absence, provided there is a legitimate excuse for the absence. Labs cannot be made up at any other time. Due to the limited time we have in lab, you will generally have to make up a lab in another section. Failure to complete all of the labs will result in a grade of F for the entire course.

### ***Tardiness***

Students who are late to lab without a verifiable excuse will not be allowed to complete the lab. Students who are repeatedly late for lecture will be asked to leave the room. We are dead serious about this. You must be on time and you must be ready to work every time you come to class.

### ***Assessment***

3 hour exams, 120 points each	360
14 laboratory experiments, 20 points each	280
14 laboratory pre-lab assignments/quizzes, 5 points each	70
Weekly lecture quizzes, 10 points each (drop the lowest 3)	120
Homework, variable points per assignment, including case studies	200
Final exam (cumulative)	<u>160</u>
<b>Total points for the course:</b>	<b>990</b>

### ***Grading***

A: 90-100%	C+: 76-77.9%
A-: 88-89.9%	C: 70-75.9%
B+: 86-87.9%	C-: 68-69.9%
B: 80-85.9%	D: 55-67.9%
B-: 78-79.9%	F: Below 55

## TENATIVE LECTURE SCHEDULE

Date	Week	Lecture Topic	Chapter	Lab Exercise
1/26	1	Course overview; atoms and elements; periodic table	1.1, 1.2, 2.1-2.4	Dimensional analysis
1/28		The mole; mass calculations	2.5	
1/30		Isotopes and radioisotopes, electronic structure, periodic trends, valance electrons, LDS, octet rule	3.2-3.3	
2/2	2	Ions and ionic compounds	3.2-3.3	Measurement
2/4		Covalent bonds, polyatomic ions	3.5, 3.6	
2/6		Formula and molecular weight, molar mass	3.7	
2/9	3	Structural formulas	4.1	Molecular models
2/11		Electronegativity , polarity, molecular shape	4.2	
2/13		Intermolecular forces	4.3	
2/16	4	States of matter and energy , gases and pressure, gas laws	5.1-5.3	Inorganic components of urine
2/18		Gases – partial pressures, liquids, vapor pressure, solids	5.4-5.6	
2/20		Chemical equations	6.1	
2/23	5	<b>EXAM # 1 Chapters 1-5</b>		Gases – exhaled CO <sub>2</sub> ; ABG case study
2/25		Reaction types	6.2-6.4	
2/27		Reaction stoichiometry	6.5, 6.6	
3/2	6	Free energy and reaction rate	6.7	Buffers; respiratory acidosis case study
3/4		Solutions, solubility of gases in water, solubility of organic and biochemical compounds	7.1-7.5	
3/6		Concentration and dilution	7.6, 7.7	
3/9	7	Colloids and suspensions, diffusion and osmosis	7.8, 7.9	Solutions and colloids; dialysis
3/11		Acids, bases, salts, equilibrium	9.1-9.4	
3/13		Acids, bases, salts, equilibrium	9.4-9.8	
3/16	8	Acids, bases, salts, equilibrium	9.9-9.11	Molecular models – organic compounds
3/18		Alkanes	4.4-4.6	
3/20		Alkanes and alkenes	4.7-4.9	
3/23	9	Carboxylic acids, phenols	10.1-10.5	Aspirin and acetaminophen
3/25		<b>EXAM #2 Chapters 5-7, 9</b>		
3/27		Amines, amides	10.6-10.8	
3/30		<b>Spring Break-No Class</b>		

4/1		<b>Spring Break-No Class</b>		
4/3		<b>Spring Break-No Class</b>		
4/6	10	Stereochemistry	10.9	Organic reactions
4/8		Alcohols, ethers	11.1-11.3	
4/10		Aldehydes and ketones	11.4-11.7	
4/13	11	Simple lipids	8.1-8.3	Carbohydrates and diabetes
4/15		Complex lipids, membranes	8.4-8.5	
4/17		Membranes	8.6-8.7	
4/20	12	Monosaccharides	12.1-12.3	Lipids; fat in foods. Cholesterol case study
4/22		Oligo- and Polysaccharides	12.4-12.5	
4/24		Amino acids, peptides	13.1-13.3	
4/27	13	Proteins, enzymes	13.4-13.6	Lactate dehydrogenase, heart attack case study
4/29		<b>EXAM #3 Chapters 8, 10, 11</b>		
5/1		Nucleic Acids	14.1-14.3	
5/4	14	DNA	14.4-14.7	DNA and pre-natal metabolic tests
5/6		RNA, translation, mutation	14.8-14.11	
5/8		Metabolism	15.1-15.3	
5/11	15	Glycolysis, gluconeogenesis, glycogen metabolism	15.4-15.6	Laboratory exam
5/13		Citric acid cycle, ETC/OP	15.7-15.8	
5/15		Lipid metabolism	15.9	
5/20		<b>FINAL EXAM-cumulative Weds, May 20th: 12:45-2:45 PM</b>		

## LAB SCHEDULE

<b>WEEK</b>	<b>CONCEPT</b>	<b>ACTIVITY</b>
1	<b>Dimensional analysis</b>	Check-in; learn DA technique; solve DA problems in nursing context.
2	<b>Measurements</b>	Learn to make basic measurements; precision and accuracy; overdose case study.
3	<b>Molecular structure and shape</b>	Work with molecular models to understand structure and shape of simple compounds.
4	<b>Inorganic compounds</b>	Learn important inorganic compounds of the body; clinical case study.
5	<b>Gases</b>	Learn basic gas laws, especially partial pressures of CO <sub>2</sub> , using exhaled CO <sub>2</sub> gases. Use of EMT CO <sub>2</sub> indicators.
6	<b>Acids</b>	Use cabbage indicator buffers to demonstrate basic concepts of pH, acids, and buffers; respiratory acidosis case study.
7	<b>Solutions</b>	Examine solutions and colloids; learn how dialysis works.
8	<b>Organic Structure</b>	Examine organic structures and shapes using molecular models.
9	<b>Organic Reactions - alkenes, alcohols, and carbonyls.</b>	Exercise demonstrating fundamental organic reactions (addition, substitution, redox) of alkenes, alcohols, and carbonyls. Emphasis will be on biologically relevant reactions.
10	<b>Esters and Acids - reactions and pain medications.</b>	Synthesis of aspirin and acetaminophen. Drug compatibility case study.
11	<b>Carbohydrates.</b>	Glucose testing, diabetes case study.
12	<b>Lipids.</b>	Extraction of oils from chips. Lipid panels case study.
13	<b>Enzymes.</b>	Properties of a clinically important enzyme (lactate dehydrogenase).
14	<b>Neonatal screening tests (DNA, metabolic)</b>	Simple DNA isolation, PKU test. Metabolic case study.
15	<b>FINAL EXAM</b>	<b>Covers all 14 labs.</b>