

Vanguard University
School for Professional Studies
Degree Program

“INTEGRATED CHEMISTRY”

CHEM 210

Student Guide

Last Updated: 08/11

tmsirvent

COURSE DESCRIPTION

This course is designed to give beginning students who have not had prior exposure to chemistry, a basic overview in general, organic and biochemistry. The following topics will be surveyed: matter and energy, atomic theory, stoichiometry, nomenclature, the periodic table, atomic structure, gas, liquid and solid states, solutions, nuclear chemistry, functional groups, alkanes, alkenes, alcohols, ethers, aldehydes, ketones, amines, carboxylic acids, lipids, carbohydrates, amino acids, proteins, nucleic acids, metabolism and respiration, photosynthesis, transcription, translation, kinetics and DNA replication.

Upon completion of this integrated chemistry course, the student will have an understanding of basic principles paramount to the study of chemistry, a mastery of stoichiometry (as it relates to the nursing discipline), writing and interpreting chemical formulas, nomenclature, and a familiarity of the biochemical processes of glycolysis, TCA cycle, photosynthesis, DNA replication, transcription and translation. In addition, the student should develop an appreciation for the importance of chemistry in other disciplines. Lab fee: \$75.

COURSE OVERVIEW

This ten week course provides nursing students a thorough introduction to the important concepts of general, organic and biological chemistry in an integrated format. The course begins with an introduction to matter and scientific measurements. Understanding how measurements are taken as well as how calculations and conversions are performed is extremely important to the nursing profession! Finally, the last few chapters introduce the concepts of biochemical metabolism including discussions of proteins, carbohydrates, fats, vitamins, minerals (and how they are metabolized).

Approximately two chapters will be covered each week. It is expected that the student already has had some familiarity with chemical principles either through high school biology and/or chemistry. Within the context of each chapter, essential case-studies that are Health-related are discussed. Much of the key information in the text can be learned in a cooperative manner using a technique called Process-oriented guided inquiry (POGIL). A significant portion of class time will be devoted each week for students to learn key chemical concepts in a guided manner through the use of groups. It is *essential*, therefore, that students attend each class session.

Homework assignments will be completed outside of class; thus students will review important structure and functional details of chemistry through an online homework management website called: MASTERING CHEMISTRY (<http://www.masteringchemistry.com/>). The student is responsible for viewing and starting this assignment *prior* to the next lecture session. It will not be due, however, until after lecture. The purpose of asking students to at least view the animations, is that it provides a basis for the lecture and students won't be so "lost" during the lecture sessions. The student will be asked questions

about the material via a class discussion or through active-learning exercises in class (called POGIL activities).

A strong emphasis is placed upon understanding and practicing the scientific method. Students will become familiar with in-class guided-inquiry assessments, analyzing data from laboratory experiments, and linking information learned in lecture to real-world questions and issues. In this way, non-science students may learn, critique and apply important biological concepts, which may assist them in achieving better health and quality of life.

TEXT AND MATERIALS

Required texts:

Frost, R., T. Deal, and K. Timberlake. 2011. 1st Edition. *General, Organic, and Biological Chemistry: An Integrated Approach*. Prentice Hall. ISBN 978-0-8053-8178-8.

Mastering Chemistry Access Code. If the textbook is purchased at the bookstore, then the Access Code is included. If not, purchase one at <http://www.masteringchemistry.com/> for \$45.00.

Required URLs¹:

There are two websites you will have to access for this course: Moodle and MasteringChemistry. At the MasteringChemistry site, approximately every week, a new animation and homework assignment will be assigned. You are responsible for viewing these materials and completing the homework. In order to access the learning materials for MasteringChemistry, you must first use a PC running XP with IE or VISTA running FireFox. Windows 7 should also work as well. If you are a MAC user, you will need to use either Safari or FireFox.

Point your browser to <http://www.masteringchemistry.com/>. At your first login, you will have to either supply the Access Code that came with your textbook or purchase an Access Code. Then you will be at the regular login page. After your registration and successful login, you should be able to search for a course. The Course ID you are looking for is: **MCSIRVENT41339**. Enroll in this course. You will see assignments.

The class will also be using an online elearning system. We will be using VU's elearning site: <http://learn.vanguard.edu>. This website contains all the information pertinent to homework assignments, formal online quizzes to be completed for a grade, and your gradebook for the semester. This website will be your central clearinghouse for all information and materials pertinent to CHEM 210. You will need to login into the system using your VU netID and your VU password. You maybe prompted for a password

¹You must have access to a computer. If you do not have one available to you, the college has a computer lab available in the library and in the Scott building. Finally, there is a dedicated computer lab in the science offices available from 8am to 5pm.

to join the class. We use the last name of the first author. In this case it is *Frost*. Once you login, you can edit your profile and change your email settings from VU's default vanguard.edu address to one of your choosing. All formal class communications will occur through Moodle, so make sure your preferred email address is listed.

Materials:

A one-time lab fee of \$75 is required to supply each laboratory with needed materials (perishable and non-perishable), required equipment, instrument repair & maintenance, and broken/stolen/otherwise damaged supplies and equipment.

LEARNING OUTCOMES

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

1. Define the four areas of chemistry.
2. List the other disciplines related to the study of chemistry.
3. Master chemical conversions including simple stoichiometric problems.
4. Master writing and interpreting chemical formulas including using appropriate nomenclature.
5. Recognize organic functional groups and common biological molecules.
6. Describe the fundamental pathways of cellular respiration.
7. Demonstrate a knowledge of the DNA replication processes.
8. Identify the processes of protein synthesis.
9. Practice basic laboratory safety principles in an efficient manner.
10. Understand basic principles of chemical experimentation including recognizing chemical equipment and instrumentation.
11. Understand the scientific method.

COURSE POLICIES²

- **ATTENDANCE AND TARDY POLICY**

You must attend class on time and remain present until dismissed. Class attendance is necessary in order to complete the course. The School for Professional Studies relies on the dynamics of class interaction and group processing in order to integrate and apply the learning of academic content. This model also emphasizes the development and practice of interpersonal communication skills and teamwork (e.g., group problem solving and negotiation). The format therefore necessitates class attendance. In practical terms, one course session is equivalent to three weeks of traditional semester course work.

Students who miss two class meetings (or more than seven class hours) in any given course will automatically receive a failing grade and need to retake the course to obtain a passing grade. If an instructor deems that a student's second absence was under extremely unavoidable and unusual circumstances (i.e., an auto accident), the professor may file an academic petition on behalf of the student to the Director of SPS. If the academic petition is approved, the instructor may give the student a "W" (withdrawal) grade in place of a failing grade. The student will still be required to retake the course.

At the professor's discretion and upon advance approval, students may be permitted to make up one (1) absence. The student will answer one assigned problem from each unit covered on the day of the absence. Participation points for the missed class cannot be recovered.

Students who arrive late disturb the class. At the professor's discretion, students who arrive late may not receive participation points for the unit covered. Students who are habitually late may be asked to drop the course.

- **CLASS PARTICIPATION**

You must be prepared and participate in all discussions. Criterion: Is the student engaged in classroom discussions? Does the student demonstrate an ability to handle assigned material with a degree of proficiency (e.g., demonstrate the type of questions and issues consistent, and reflecting a familiarity with the assigned material)? Participation evaluated according to quality, not quantity, of participation. Attendance will be scored, and no participation points will be awarded if the student is absent.

²These are SPS Course Policies.

- **LATE PAPER POLICY**

You are responsible for submitting assignments on time (by 11:55pm). *No credit* will be given for assignments not turned in when due. All assignments are electronic and will be submitted through Moodle or the Mastering Chemistry websites.

- **ACADEMIC DISHONESTY**

As members of Vanguard University, we commit ourselves to honesty. As we strive for excellence in performance, integrity—personal and institutional—is our most precious asset. Work submitted for assessment purposes must be the independent work of the student concerned. Plagiarism, or copying and use of another's work without proper acknowledgment, is not permitted. Nor is it permissible for any former or present student to allow another student to refer to, use as a sample, or in any way copy or review their work. If a student needs guidance, he or she must seek the Professor's assistance.

Honesty in our academic work is vital, and we will not knowingly act in manners that erode integrity. Accordingly, we pledge not to cheat, nor to tolerate cheating, nor to plagiarize the work of others. Acts of dishonesty will be dealt with according to established procedures as described in the Academic catalog. The penalty for an instance of proven cheating in this course at any time will result in failure for the course.

- **STUDENTS WITH SPECIAL NEEDS**

Students with a disability that affects their academic performance or that has a need for any in-class accommodations or special test-taking arrangements because of a physical and/or perceptual limitations are expected to arrange for a conference with the instructor in order that appropriate strategies can be considered to ensure that participation and achievement opportunities are not impaired. Students should contact Director of Learning Skills, Barbi Rouse in the Student Life Center, x2540.

ASSIGNMENTS AND GRADING

Homework Assignments from the chapters (12) ³	120
Lecture Quizzes (5) ⁴	100
POGIL Sheets (6) ⁵	60
Experiments (4) ⁶	100
PreLAB Assignments (4) ⁷	40
Lab Quizzes (4) ⁸	40
Exams (2)	200
TOTAL	685

STUDENT EVALUATION

Percentages	Grade	Significance	GPA
93-100%	A	Exceptional	4.00
90-92.4%	A-		3.67
87-89.4%	B+		3.33
83-86.4%	B	Above Average	3.00
80-82.4%	B-		2.67
77-79.4%	C+		2.33
73-76.4%	C	Average	2.00
70-72.4%	C-		1.67
67-69.4%	D+		1.33
63-66.4%	D	Below Average	1.00
60-62.4%	D-		0.67
0-59.4%	F		0.00

³A total of 13 homework assignments are given. Only the 12 highest are counted for a grade. The lowest score is dropped.

⁴A total of 6 in-class quizzes are given (including the safety quiz on the first day). Only the five highest quiz scores are counted for a grade. The lowest quiz grade is dropped from calculation.

⁵A total of 7 in-class POGIL Assignments are given. Only the 6 highest scores are counted for a grade. The lowest grade is dropped from calculation.

⁶Although there are 5 experiments performed in class, the lowest one is dropped. This will accommodate those who have to miss the class for any reason. **NOTE:** there are no “make-up” labs.

⁷Although there are 5 experiments (and consequently 5 PreLAB assignments) assigned, the lowest one is dropped. This will accommodate those who have to miss the class for any reason. **NOTE:** there are no “make-up” labs.

⁸There are a total of 5 Lab Quizzes, but the lowest grade will be dropped.

STUDENT ASSIGNMENTS

Week	Learning Outcomes Class Assignments	In Class Activities
1	<p>Learning Objectives:</p> <ol style="list-style-type: none"> 1. Explain the scientific method. 2. Define the 3 states of matter & the 2 forms of energy. 3. Describe & give examples of physical properties and physical changes. 4. Covert measurements. 5. Differentiate between accuracy and precision. 6. Understand how to use correct significant figures & scientific notation. 	
	<p>Homework Problems:</p> <p>HW1–PreAssignment: Learning how to use Mastering Chemistry</p> <p>HW2–CH 1: Mastering Chemistry</p>	POGIL 1
2	<p>Learning Objectives:</p> <ol style="list-style-type: none"> 1. Describe the subatomic structure of an atom. 2. Define an element and an atomic symbol. 3. Define atomic number & mass number (atomic weight). 4. Define isotopes. 5. Define nuclear radiation. 6. Describe the four common types of radiation. 7. Define a mole and be able to use the mole in calculations. 8. Understand the concept of valence electrons. 9. Be able to draw electron dot structures. 10. Define & be able to name ions, including: cation, anion, and polyatomic ion. 11. Differentiate between an ionic and covalent bond. 12. Be able to write the formulas and name simple ionic & covalent binary compounds. 13. Be able to convert weights of compounds using the mole. 14. Define electronegativity & explain its relationship to polar bonds. 	
	<p>Homework Problems:</p> <p>HW3–CH 2: Mastering Chemistry</p> <p>HW4–CH 3: Mastering Chemistry</p>	POGIL 2

Week	Learning Outcomes Class Assignments	In Class Activities
3	<p>Learning Objectives:</p> <ol style="list-style-type: none"> 1. Understand the concept of chirality, and be able to distinguish chiral molecules. 2. Define enantiomers, diastereomers, dextrorotatory, and levorotatory. 3. Become proficient in naming hydrocarbons. 4. Recognize organic functional groups. 5. Construct various isomers from a molecular formula. 6. Understand the basic premise of IUPAC nomenclature. 	
	<p>Homework Problems: HW 5–CH 4: Mastering Chemistry</p>	POGIL 3
4	<p>Learning Objectives:</p> <ol style="list-style-type: none"> 1. Differentiate between mono-, oligo-, and polysaccharides. 2. Identify the 4 common types of monosaccharide derivatives. 3. Define a reducing sugar. 4. Be able to identify anomers & epimers. 5. Identify four important disaccharides and understand how they are linked together. 6. Differentiate between a homopolysaccharide and a heteropolysaccharide. 7. Define hydrophobic, hydrophilic and amphipathic. 8. Be familiar with the different categories of lipids. 9. Differentiate between saturated, monounsaturated and polyunsaturated fatty acids. 10. Identify the molecules used to make waxes. 11. Name 3 types of eicosanoids and their biological functions. 12. Identify the components of a cellular membrane. 	
	<p>Homework Problems: HW 6–CH 5: Mastering Chemistry HW 7–CH 6: Mastering Chemistry</p>	POGIL 4
5	<p>Learning Objectives:</p> <ol style="list-style-type: none"> 1. Be able to convert between various concentration units of solutions. 2. Be able to calculate the concentration of a diluted solution. 3. Differentiate between solutions, suspensions, and colloids. 4. Understand the principles of diffusion and osmosis. 	
	<p>Homework Problems: HW 8–CH 7: Mastering Chemistry</p>	EXAM 1

Week	Learning Outcomes Class Assignments	In Class Activities
6	<p>Learning Objectives:</p> <ol style="list-style-type: none"> 1. Identify the common characteristics of acids and bases. 2. Describe Brønsted-Lowry acids and bases. 3. Be able to determine the conjugate acids and conjugate bases. 4. Be able to write an equilibrium constant for a reversible reaction. 5. Be able to use $[H_3O^+]$ & pH to identify a solution as being basic, acidic, or neutral. 6. Describe the processes of neutralization and titration. 7. Define buffers. 8. Understand the basic structure of amino acids (aa). 9. Understand the effect of pH of the structure of aa. 10. Identify oligopeptides and polypeptides. 11. Differentiate between and understand the intermolecular forces that are responsible for 1°, 2°, 3°, & 4° protein structure. 12. Define denaturation. 	
	<p>Homework Problems:</p> <p>HW 9–CH 8: Mastering Chemistry</p> <p>HW 10–CH 9: Mastering Chemistry</p>	POGIL 5
7	<p>Learning Objectives:</p> <ol style="list-style-type: none"> 1. Understand the concept of specificity. 2. Understand the basic concepts of Michaelis-Menten enzyme kinetics, including the terms K_M and V_{max}. 3. Define allosteric enzymes. 4. Understand the effects of activators and inhibitors on enzymes. 5. Define feedback inhibition, covalent modification, and zymogens. 6. Describe the makeup of nucleosides, nucleotides, oligonucleotides, and polynucleotides. 7. Differentiate between 1°, 2° and 3° structure of DNA. 8. Differentiate between the 3 types of RNA. 9. Understand the process of DNA replication. 10. Understand the process of protein synthesis including the roles of the various types of RNA. 11. Be familiar with how gene expression is controlled. 12. Define mutation. 	
	<p>Homework Problems:</p> <p>HW 11–CH 10: Mastering Chemistry</p> <p>HW 12–CH 11: Mastering Chemistry</p>	POGIL 6

Week	Learning Outcomes Class Assignments	In Class Activities
8	<p>Learning Objectives:</p> <ol style="list-style-type: none"> 1. Define the terms metabolism, catabolism, and anabolism. 2. Be familiar with the 3 different types of metabolic pathways. 3. Name the products formed during the digestion of polysaccharides, triglycerides, and proteins & state where the digestion of each takes place. 4. Identify the overall net reaction of glycolysis. 5. Differentiate between glycolysis and gluconeogenesis. 6. Define glycogen and identify its precursor molecule. 7. Be familiar with the “big picture” of the TCA cycle and know what the end products are. 8. Define β-oxidation. 9. Understand how amino groups are catabolized and excreted from the body. 	
	Homework Problems: HW 13–CH 12: Mastering Chemistry	POGIL 7 FINAL

ASSIGNMENT CHECKLIST***Homework Assignments*** (1 drop)

- | | |
|---|-------------------------------------|
| <input type="checkbox"/> HW 1: Pre-Assignment | <input type="checkbox"/> HW 8: Ch 7 |
| <input type="checkbox"/> HW2:Ch1 | <input type="checkbox"/> HW9:Ch8 |
| <input type="checkbox"/> HW3:Ch2 | <input type="checkbox"/> HW10:Ch9 |
| <input type="checkbox"/> HW4:Ch3 | <input type="checkbox"/> HW11:Ch10 |
| <input type="checkbox"/> HW5:Ch4 | <input type="checkbox"/> HW12:Ch11 |
| <input type="checkbox"/> HW6:Ch5 | <input type="checkbox"/> HW13:Ch12 |
| <input type="checkbox"/> HW 7: Ch 6 | |

POGIL Assignments (1 drop)

- | | |
|--|--|
| <input type="checkbox"/> PGL 1: Conversions & Atoms | <input type="checkbox"/> PGL 5: Acids, Bases & Solutions |
| <input type="checkbox"/> PGL 2: Ions & Cmpnds | <input type="checkbox"/> PGL 6: Amino Acids, Proteins & Nucleic
Acids |
| <input type="checkbox"/> PGL 3: Organic Cmpnds | <input type="checkbox"/> PGL 7: Metabolism |
| <input type="checkbox"/> PGL 4: Carbohydrates and Lipids | |

Experiments (1 drop)

- | | |
|--|--------------------------------------|
| <input type="checkbox"/> EXP 1: Household Chemistry | <input type="checkbox"/> EXP 5: GMOs |
| <input type="checkbox"/> EXP 2: Gases | |
| <input type="checkbox"/> EXP 3: Alcohols & Membranes | |
| <input type="checkbox"/> EXP 4: Starches | |

Lab Quizzes (1 drop)

- | | |
|--|---|
| <input type="checkbox"/> Qz 1: Safety | <input type="checkbox"/> Qz 4: Instrumentation and Organics |
| <input type="checkbox"/> Qz 2: Basic Chemistry Definitions | <input type="checkbox"/> Qz 5: Biochemistry and Biotechnology |
| <input type="checkbox"/> Qz 3: Gases | |

Lecture Quizzes (1 drop)

- | | |
|--|---|
| <input type="checkbox"/> Qz 1: Ch 1-3 – Atoms, Compounds | <input type="checkbox"/> Qz 5: Ch 9-10 – Amino Acids, Proteins &
Enzymes |
| <input type="checkbox"/> Qz 2: Ch 4 – Organics | |
| <input type="checkbox"/> Qz 3: Ch 5-6 – Carbs & lipids | <input type="checkbox"/> Qz6:Ch11– Nucleic acids & Metabolism |
| <input type="checkbox"/> Qz 4: Ch 7-8 – Solutions, Acids & Bases | |

LOGISTICS CHART

Hour	Wk 1: 8/22	Wk 2: 8/29	Wk 3: 9/15	Wk 4: 9/12	Wk 5: 9/19	Wk 6: 9/26	Wk 7: 10/3	Wk 8: 10/10
6:00p	Introduction to class. Orientation to Websites	Discussion of CH 2 & 3.	Discussion of CH 4	Discussion of CH 5 & 6.	Review	Discussion of CH 8 & 9.	Discussion of CH 10-11.	Discussion of CH 12.
7:00p	Discussion of CH 1 Review of homework assignments.	Discussion of CH 2 & 3, cont'd. Questions re: Hmwk.	Discussion of CH 4 cont'd. Questions re: Hmwk.	Discussion of CH 5 & 6, cont'd. Questions re: Hmwk.	Exam 1	Discussion of CH 8 & 9, cont'd. Questions re: Hmwk.	Discussion of CH 10 & 11, cont'd.	Review
8:00p	Introduction to POGIL. 1st POGIL sheet re: measurements.	2nd POGIL sheet.	3rd POGIL sheet.	4th POGIL sheet.	Discussion of CH 7	5th POGIL sheet.	6th POGIL sheet.	7th POGIL sheet.
9:00p	Introduction to the laboratory. Safety video.	Experiment 1: Household Chemicals	Experiment 2: Alcohol Effects	Experiment 3: Gas Laws		Experiment 4: Analysis of Starch	Experiment 5: GMOs	Experiment 5: GMOs cont'd.
<i>Work Due:</i>	HW1 HW2 Safety Quiz 1	HW3 HW4 Lab Quiz 2 Lecture Quiz 1 PreLAB 1	HW5 Lab Quiz 3 Lecture Quiz 2 PreLAB 2 Exp. 1	HW6 HW7 Lecture Quiz 3 PreLAB 3 Exp. 2	Exp. 3	HW9 HW10 Lab Quiz 4 Lecture Quiz 4 PreLAB 4	HW11 HW12 Lecture Quiz 5 PreLAB 5 Exp. 4	HW13 Lab Quiz 5 Lecture Quiz 6 Exp. 5