

Grant MacEwan University
UNIVERSITY CHEMISTRY I CHEM 101 (AS45)
Fall 2011

Instructor Information

Instructor: Dr. Lucio Gelmini
Office: 5-132H **Phone:** 780.497-5813 **Fax:** 780.497-5655
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Course Information

Lecture Time: Noon – 2 PM Tuesdays and Thursdays **Lecture Room:** 5-152
Office Hours: By appointment, also 2 - 3:30 PM (Tuesdays and Thursdays)
Mondays 9:30 – 10:30 in 7-170
Hours: Lecture: 3h Lab: 3h Seminar: Additional 1h (incorporated into lecture)

Description: This course serves as a foundation for all subsequent chemistry courses. Atomic properties as they relate to the periodic table are considered, along with quantum mechanics for hydrogen-like orbitals and electronic configurations. The course provides an introduction to bonding theories as they apply to stability, molecular geometry and intermolecular interactions of atomic, ionic and molecular species. Topics include chemical nomenclature, stoichiometry, classification of chemical reactivity, gases (both ideal and real) and chemical kinetics.

Objectives:

- to learn the inter-relationships between topics in chemistry, science, and society
- to learn how to independently set-up and solve chemistry-related problems
- to learn how to safely handle hazardous and/or toxic chemicals

Prerequisite: Chemistry 30 or equivalent (*mandatory*)

Required Resources: *Chemical Principles* Steven S. Zumdahl (6th Edition)+solution manual(optional)
CHEM 101 Laboratory Manual (current edition)

Laboratory: Laboratory classes begin the second week of the term. Attendance at the Introductory/Safety Orientation is mandatory; you will not be permitted to do experimental work until you have attended this orientation session. For all experiments, you must be in-class and prepared to complete the experiment at the beginning of the laboratory class. This ensures that you are present for the pre-laboratory presentation, which contains important experimental and safety information. You must complete more than 70 % of the laboratory experiments and must pass the laboratory component (minimum 50 %) in order to pass the course. A maximum course grade of D+ is given to students who do not pass the laboratory component. Students wishing to dispute the marking of their reports/quizzes must contact their instructor within two working days from the date they are returned/shown to the student.

Make-up labs are not available. If you know that you will be unable to attend a scheduled laboratory period, it is *your* responsibility to inform your laboratory instructor at least one week prior so that you can complete the experiment in another laboratory session. If a laboratory period is missed for a *valid* reason, the experiment will not be counted towards the final laboratory grade but will count as an uncompleted experiment. In all other cases, a mark of zero will be assigned.

During all laboratory sessions — including the first one — you are required to wear a laboratory coat and safety glasses at all times and have your laboratory manual with you. The laboratory and lecture components of this course are not synchronized. For some experiments, you will be expected to independently find and learn material to understand and complete the experiment. This requires independent learning — a skill expected of students.

Evaluation:

Term Examination I	15 %	13 Oct (<i>tentative</i> ; 1.5 hr.; in class)
Term Examination II	15 %	8 Nov (<i>tentative</i> ; 1.5 hr.; in class)
Assignments and quizzes	10 %	<i>Throughout term TBA</i>
Laboratory Course	30 %	Lab examination: 01 Dec (1830 – 2030; TBA)
Final Examination	30 %	8 Dec (9:00 AM – Noon) in Gymnasium

Copies of selected student examinations, or sections thereof, will be taken. This information will be used to thwart cheating, prepare future examinations, etc. Students are responsible for verifying the date of the final examination when the final examination schedule is posted later in the term.

OWL and Quizzes/Assignments:

MacEwan Chemistry is piloting the OWL (Open Web Lecture) resource accompanying the textbook. For each chapter, your instructors have selected questions for you to practice and assess your understanding of the course material.

Section assignments will be OWL based and/or handed-in.

OWL-based assignments: after the section of the course is completed, students will be given access to the assignment questions on OWL. Access is granted for a fixed period of time. After which, student grades for that assignment will be calculated.

Quizzes and hand-in assignments are based on the end-of-chapter questions in the textbook. Students may use OWL to do optional questions suggested by their instructor in order to prepare.

Blackboard: Blackboard is a web-based course management system hosted by MacEwan. You will be given access to the chemistry lecture and chemistry laboratory Blackboard websites. These resources will contain sample exams, supplementary instructional material, and a discussion forum for students to ask questions and assist each-other.

Student expectations: In teaching this course, I make certain assumptions regarding your input into this course. These assumptions set the instructional level and evaluation level.

Students are assumed to

- have pre-read the chapter before it is presented in class
- review the notes taken in class before the next class
- work on the assigned questions regularly and solve similar problems during the examination
- ask for clarification if they cannot understand a concept or cannot solve an exercise
- have attempted to solve an exercise before asking for assistance with the exercise

Grading: Grant MacEwan University adheres to the Alberta Common Grading Scheme, which is a letter grade system. While instructors may use percentages to aid in their grade development, only the letter grade will appear on transcripts. A minimum grade of C– is required to receive transfer credit or to satisfy a prerequisite for a higher-level course. The letter grades, corresponding 4 point grade scale, and *approximate* corresponding percentages are given below.

4.0	A+	≥ 95 %	3.0	B	75 % – 79 %	1.7	C–	55 % – 59 %
4.0	A	90 % – 94 %	2.7	B–	70 % – 74 %	1.3	D+	53 % – 54 %
3.7	A–	85 % – 89 %	2.3	C+	65 % – 69 %	1.0	D	45 % – 52 %
3.3	B+	80 % – 84 %	2.0	C	60 % – 64 %	0.0	F	< 45 %

Official final grades can be accessed through Web Advisor.

Important Dates:	06 Sep	1 st first day of classes
	12 Sep	Laboratory classes begin
	13 Sep	Last day for program changes (drop/add courses)
	10 Oct	Thanksgiving day (no classes or laboratories)
	13 Oct	Term exam 1
	8 Nov	Term Exam 2
	10 Nov	Last day to withdraw without academic penalty
	11 Nov	Remembrance day (no classes or laboratories)
	01 Dec	Lab examination: (1830 – 2030; TBA)
	06 Dec	Last day of instruction
	07 – 16 Dec	Final examinations
	08 Dec	Final examination (9:00 AM – Noon) in Gymnasium

Student Responsibilities

Students are expected to be aware of their academic responsibilities as outlined in the Academic Policies, Procedures, and Regulations section in the University Calendar.

ACADEMIC INTEGRITY: All forms of student dishonesty are considered unacceptable. MacEwan's Academic Integrity policy (C1000) promotes honesty, fairness, respect, trust, and responsibility in all academic work. According to the policy, "Academic dishonesty involves participating in acts by which a person fraudulently gains or intentionally attempts to gain an unfair academic advantage thereby compromising the integrity of the academic process". All incidents of academic dishonesty are reported and recorded by the Office of Academic Integrity. The penalties and sanctions for academic dishonesty can include the following: a mark reduction up to zero on a piece of academic work, a grade reduction up to an F in the course, and suspension or expulsion (with transcript notation) from the University. Please see the academic policy at <www.macewan.ca/academicintegrity> for more details. You are responsible for understanding what constitutes academic dishonesty.

REGISTRATION STATUS: You are responsible for your registration status at the University. Program Advisors may assist you with the process of registration, including adding or dropping of courses, but it is your responsibility to verify that these changes have been officially completed. This verification can be done at any time using myStudentSystem. You should check your official registration status before the last date to officially withdraw from the course.

WITHDRAWING FROM THE COURSE: If you stop attending class, you must complete a Course Drop Form, have it signed by a Science Program Advisor, and submit it to the Registrar's Office by the last day to withdraw as provided in the Academic Schedule in the University Calendar. Failure to officially withdraw will result in a grade being assigned based on course work completed. Late withdrawals are only allowed for exceptional circumstances.

EXAMINATIONS: Your student photo I.D. is required at examinations. It is at the discretion of the instructor whether you will be allowed to write the examination if you arrive over 15 minutes after the examination has begun. You must remain in the examination room for at least 20 minutes from the time it commenced. Permission to use the washroom during examinations is at the discretion of the instructor and may require accompaniment.

MISSED TERM EXAMINATIONS: If you miss a term examination you must provide the instructor with an explanation within 24 hours or a grade of zero may be given. Notification may be provided through email, voice mail, or direct contact with the instructor. Official documentation as to why the examination was missed will be needed to assess whether your absence will be excused or not. If your absence is excused the weight of this examination will be added to the weight of the final examination in the course. Medical excuses must include the date you were examined, the specific dates for the period of the illness, a clear statement indicating that the severity of the illness prevented you from attending school or work, and the signature of the examining physician (a signature by office staff on behalf of the physician is not acceptable). Medical notes obtained subsequent to the date of the examination are generally not accepted. A grade of zero will be given if the instructor considers the excuse inappropriate or inadequately substantiated.

DEFERRED FINAL EXAMINATION: A deferred examination will be granted if you miss the final lecture examination for reasons considered by the Science Department to be unavoidable (deferred examinations do not apply to term or laboratory examinations). You should advise the instructor prior to the examination if you know beforehand that you will be unable to attend the scheduled examination time. An application for a deferred examination must be provided to the Science Department no later than two business days after the date of the missed final examination. Application forms are available from the Science Office and must be submitted with appropriate documentation. A grade of zero will be given on the final examination if the deferred examination is denied. Deferred examinations are granted by the Science Department, not by the course instructor. If you have any questions about the process please call the Science office at 780.497.5786.

LATE ASSIGNMENTS: As due dates for assignments are known well in advance, medical and other excuses are generally not accepted as a reason for submitting late assignments.

ELECTRONICS: All electronic equipment (cell phones, pagers, walkmans, A/V recorders, etc., *except* calculators approved by the instructor and watches) are to be turned off during class and examination periods (except with written approval of the instructor).

STUDENTS WITH DISABILITIES: Students with disabilities who may have special requirements in this course are advised to discuss their needs with Services to Students with Disabilities located in the Student Resource Centre. You should advise the course instructor(s) of any special needs that are identified. See Policy E3400 Students with Disabilities.

STUDENT APPEALS: The University has a policy regarding Student Appeals (E3103). You should access this policy to become aware of the deadlines and guidelines that need to be followed if you are appealing a grade or other University assessment.

MACEWAN EMAIL: All students are given a <name>@MyMail.MacEwan.ca email address. This email address is used by the university to communicate with students. Check your MyMail.MacEwan.ca email regularly *or* forward it to an email address you do check regularly. To protect your privacy, you must communicate using your MacEwan email account.

DISCLAIMER: *The information in this Course Outline is subject to change. Any changes will be announced in class or, if applicable, in the laboratory.*

Room: 5-132A		INSTRUCTOR: Lucio Gelmini				
Phone: 780-497-5813		gelminil@macewan.ca				
FALL 2011						
TIME	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	TIME
12:00		CHEM 101 (AS45)		CHEM 101 (AS45)		12:00
12:30						12:30
1:00	CHEM 231 (40B)	12 - 2 PM		12 - 2 PM		1:00
1:30		CCC 5-152		CCC 5-152		1:30
2:00	1 - 5 PM	Office		Office		2:00
2:30		Hours		Hours		2:30
3:00	CCC 5-014					3:00
3:30		CHEM 231 (AS40)		CHEM 231 (AS40)		3:30
4:00		3:30 - 5 PM		3:30 - 5 PM		4:00
4:30		CCC 5-204		CCC 5-204		4:30
5:00						5:00

MODULE 1

Appendix 1.

- A.1.1 – A1.5 exponents, logs, graphing, quadratic equation, measurements (students responsible to familiarize on their own)
- A1.6. Significant Figures, A13

Appendix 2. Measurement and Conversions, A15

- A2.1. Measurements, A15
- A2.2. Unit Conversions, A17

CHAPTER 2 - Atoms, Molecules, and Ions, 15

- 2.6. The Modern View of Atomic Structure: An Introduction, 29
- 2.7. Molecules and Ions, 30
- 2.8. An Introduction to the Periodic Table, 34
- 2.9. Naming Simple Compounds, 36
(includes alkanes $C_1 - C_{10}$ and identification of some Functional groups R-OH, R-X, C_6H_6 , C_6H_5-OH , $C=C$, $C\equiv C$, COOH, R-O-R, R-CO-OR, NH_2)

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- 3.1. Atomic Masses, 53
- 3.2. The Mole, 56
- 3.3. Molar Mass, 58
- 3.4. Percent Composition of Compounds, 60
- 3.5. Determining the Formula of a Compound, 62
- 3.6. Chemical Equations, 66
- 3.7. Balancing Chemical Equations, 68
- 3.8. Stoichiometric Calculations, 70
- 3.9. Calculations Involving a Limiting Reactant, 73

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- 4.1. Water, the Common Solvent, 91
- 4.2. The Nature of Aqueous Solutions, 93
- 4.3. The Composition of Solutions, 97
- 4.4. Types of Chemical Reactions, 101
- 4.5. Precipitation Reactions, 101
- 4.6. Describing Reactions in Solution, 106
- 4.7. Selective Precipitation, 108
- 4.8. Stoichiometry of Precipitation Reactions, 110
- 4.9. Acid-Base Reactions, 113
- 4.10. Oxidation-Reduction Reactions, 117

MODULE 2

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- 5.1. Early Experiments, 142
- 5.2. The Gas Laws of Boyle, Charles, and Avogadro, 143
- 5.3. The Ideal Gas Law, 146
- 5.4. Gas Stoichiometry, 150
- 5.5. Dalton's Law of Partial Pressures, 152
- 5.10. Real Gases, 171
- 5.11. Characteristics of Several Real Gases, 176
- 5.12. Chemistry in the Atmosphere, 176

CHAPTER 12 -Quantum Mechanics and Atomic Theory, 521

- 12.3. The Atomic Spectrum of Hydrogen, 530
- 12.4. The Bohr Model, 531
- 12.5. The Quantum Mechanical Description of the Atom, 536
- 12.7. The Wave Equation for the Hydrogen Atom, 548
- 12.8. The Physical Meaning of a Wave Function, 550
- 12.9. The Characteristics of Hydrogen Orbitals, 551
- 12.10. Electron Spin and the Pauli Principle, 556
- 12.11. Polyelectronic Atoms, 556
- 12.12. The History of the Periodic Table, 559
- 12.13. The Aufbau Principle and the Periodic Table, 561
- 12.15. Periodic Trends in Atomic Properties, 571

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- 13.1. Types of Chemical Bonds, 593
- 13.2. Electronegativity, 597
- 13.3. Bond Polarity and Dipole Moments, 599
- 13.4. Ions: Electron Configurations and Sizes, 603
- 13.5. Formation of Binary Ionic Compounds, 607
- 13.6. Partial Ionic Character of Covalent Bonds, 611
- 13.7. The Covalent Chemical Bond: A Model, 612
- 13.8. Covalent Bond Energies and Chemical Reactions, 616
- 13.9. The Localized Electron Bonding Model, 619
- 13.10. Lewis Structures, 620
- 13.11. Resonance, 625
- 13.12. Exceptions to the Octet Rule, 626
- 13.13. Molecular Structure: The VSEPR Model, 636

CHAPTER 14 -Covalent Bonding: Orbitals, 660

- 14.1. Hybridization and the Localized Electron Model, 661
- 14.2. The Molecular Orbital Model, 673
- 14.3. Bonding in Homonuclear Diatomic Molecules, 677
- 14.4. Bonding in Heteronuclear Diatomic Molecules, 684

CHAPTER 16 -Liquids and Solids 777

- 16.1. Intermolecular Forces, 778
- 16.2. The Liquid State, 781

MODULE 3

CHAPTER 15 -Chemical Kinetics, 714

- 15.1. Reaction Rates, 715
- 15.2. Rate Laws: An Introduction, 719
- 15.3. Determining the Form of the Rate Law, 722
- 15.4. The Integrated Rate Law, 726
- 15.5. Rate Laws: A Summary, 735
- 15.8. A Model for Chemical Kinetics, 747
- 15.9. Catalysis, 751

Learning and study guide

*KNOWLEDGE exists as neural networks in the brain. LEARNING is a biophysical process and occurs when new connections are formed between neurons, expanding the neural network. These connections are not permanent. Repeated use, in varied forms, is **critical** to strengthening the connections and expanding them to other networks. Without repetition and continued use, connections degenerate.*

1. Read the text before class.

Don't expect to understand it all, just read it. Reading the textbook before class acquaints you with the information so that the classroom is where you see the material for the second time. You *will* find yourself saying, "Oh, so *that's* what the textbook means!"

2. When studying, don't just read, write and talk!

Writing and talking are forms of active learning.

Taking notes, rewriting your notes, and completing assignments uses motor skills to further strengthen and expand the neural networks. Rewriting your notes (weekly and again at the end of term) forces you to critically review the information, follow the 'train-of-thought' of the instructor, and repeat it in your own words. Importantly, you end up with a smaller but complete set of notes from which to study! When studying, work through exercises in a simulated examination environment (i.e., without consulting the solution's manual). Cue cards or a 'super-summary' of your notes are a great study tool. These contain only the major concepts and key points; read a key point and then fill in the details in your mind.

Talking forces you to dynamically formulate your knowledge into coherent statements, again using and expanding the neural networks. Working in peer groups (two to six people) is an excellent way to pool and share knowledge. Students often explain concepts in a way that peers can relate to and teaching is an excellent way to learn.

3. Don't pull 'all nighters'.

Your ability to learn when fatigued is very low. Furthermore, your minds' ability to recall information and dynamically formulate answers is faster if you get a good nights' sleep, not live off caffeine, etc.

4. Don't study right up to the exam.

Take at least a four-hour break before the exam. Get active: go for a walk, to the gym, etc. Your mind can better consolidate what you have learned if you aren't cramming more in. Your mind will be refreshed for the exam and you will be able to recall information faster.

Exam-taking suggestions

1. Read the exam start to finish.

This should take no more than a few minutes but will give you an overview of the entire exam. Your mind will begin processing all the questions. Some instructors even give hints/answers to questions in other questions.

How many times have you been stumped on a question during the exam and, while walking away, had a revelation on how to answer it. You weren't thinking about it, were you? Now consider if your mind had been unconsciously processing that question for a while longer (like from the start of the exam).

2. Go through the exam and answer questions you know 'by heart'.

Your train-of-thought should be, "One: I know how to do this ... <answer>. Two: not a clue. Three: hmmm, not really sure. Four: oh yeah, that's how four is done ...<answer>. Five: like this ... <answer>. Six: ..."

Rereading the questions will keep your mind working on them. When the revelation strikes: "Oh yeah, that's how question three is done!"; go back and complete three while it is still fresh in your mind. If you are stuck on a question, move on to the next one.

3. Go through the exam and write something for questions you haven't tried yet.

As you take higher-level courses, questions become more complex and there may be more than one path to the correct answer. Writing may spark an idea. Try rewriting the question in your own words and jotting down ideas. Don't be afraid to write something that may be wrong. If nothing else, putting something on paper gives the instructor something to mark! ☺

4. Reread each question and your answer.

If you begin to second-guess yourself, leave the first answer! Studies have shown that the first answer is more often correct. *Only* change an answer if there is an obvious mistake, like you misinterpreted the question. For mathematical questions, consider:

Is the answer of *reasonable* magnitude? Is it dimensionally correct (unit analysis)?

Redo the calculations to ensure you haven't made a simple mathematical error.