**Introductory Chemistry I (CHMA10H3)**
**Fall 2018 Syllabus**
**University of Toronto at Scarborough**

Dear Students,

Welcome to Introductory Chemistry Part I! Our primary goal is to ignite your passion for chemistry by creating a meaningful learning environment with many real life applications of chemistry. The knowledge you gain in this course is applicable in diverse disciplines, including Medicine, Pharmacy, Environmental Sciences, Neuroscience, Biochemistry and Biology. We are looking forward to teaching you many interesting topics on molecular structure, chemical reactions and nuclear chemistry. Please read the course syllabus to understand the learning expectations and assessment methods. Looking forward to meeting all of you! Although it is there are no pre-requisites for this course, it is highly recommended that you have completed grade 12 Chemistry and Grade 12 Advanced Functions or Grade 12 Calculus. The lectures for this course are three times a week for one hour and you are strongly encouraged you to attend all the lectures to engage in the participatory lessons!

**Instructors:**
Dr. Marco Zimmer-De Iuliis
Office: EV546
email: m.zimmer.deiuliis@utoronto.ca
Lecturing from September 5th until October 5th, 2018
Office Hours: Monday, Wednesday and Friday from 10:00 am – 11:00 am

Dr. Xiao-An Zhang
Office EV550
Email: xazhang@utsc.utoronto.ca
Lecturing from the week of October 15th to December 3rd, 2018
Office Hours: Monday, Wednesday and Friday from 3:30 am – 4:30 pm

**Lab Manager:**
Dr. Scott Ballantyne
Office: SW155C
Email: sballant@utsc.utoronto.ca
Office Hours: Mon and Wed 10:30 am to 12:00 pm

**Email Policy:**
Please use the following guidelines when sending emails:

i. Use your UTSC account for all your correspondences. If other accounts (Yahoo, Gmail, Hotmail, etc.) are used, your email will be filtered out as spam and may not be received.
ii. Put "*CHMA10*" in the subject line followed by the reason for the email and use professional language with a formal greeting.
iii. Sign the email with your first and last name. Include your student ID number after your name.

Every effort will be made to respond to student emails within 36 hours (M-F) provided that the above protocol is used.

**Required Text Book:**
Chemistry: A Molecular Approach, 2nd Canadian Edition, by Nivaldo J. Tro, Travis D. Fridgen, Lawton E. Shaw, Pearson Canada Inc.

**Lectures:**
LEC01: Mondays, Wednesdays, and Fridays from 12:00 pm – 1:00 pm
LEC02: Mondays, Wednesdays, and Fridays from 1:00 pm – 2:00 pm.
We **strongly encourage** all of you to attend all the lectures to engage in the participatory lessons. Lecture casting of each lecture will be available for **only seven (7) days** from the day of the lecture.

**Active Learning in CHMA10H3:**
During lectures, we will be using Learning Catalytics through Mastering Chemistry (which you should have already purchased with your text book). Learning Catalytics is a real-time polling system that can be used with a cell phone, tablet or laptop during class time so that students can practice their skills with the guidance of an instructor and their peers. Students registered in LEC01 or LEC02 will have part of their grade awarded from their performance with Learning Catalytics. For a video introduction, please see this video: https://www.youtube.com/watch?v=CdREwm4NUsg

**Assignments through Mastering Chemistry:**
Throughout the course, you will be assigned a set of questions through mastering chemistry to help you practice the skills and concepts taught during lecture. You can access your mastering chemistry page through a website that will be provided to you on the quercus page. For technical support, please contact Marguerite Weir at marguerite.weir@pearsoned.com if you have any issues.

**Website:**
CHMA10H3 maintains a Quercus web space, which archives a variety of course related information including: grades, class announcements, lectures and lab materials. Class e-mails will be sent periodically to your "utoronto.ca" e-mail account. **To login,** go to: https://q.utoronto.ca. Login using your UTORid username and password. Then click on the CHMA10 link.

**Announcements:**
Official announcements regarding test locations, material covered for each test and other important announcements will be posted on the CHMA11H3 course web site. It is absolutely your responsibility to check these postings regularly for important announcements.

**Accessibility:**
Students with diverse learning styles and needs are welcome in this course. If you require accommodations for a disability, or have any accessibility concerns about the course, the classroom or course materials, please contact us and or the Accessibility Services as soon as possible: SW 302, (416) 287-7560 or ability@utsc.utoronto.ca

**Peer Facilitator Program:**
Facilitated Study Group (FSG) is being run through the Centre for Teaching and Learning. These weekly sessions are open to all students taking this course who want to improve their understanding of course material, improve their study techniques, and improve their grade. Attendance is voluntary. In these sessions you will compare notes, discuss important concepts, develop study strategies, and prepare for exams and assignments on course material. Course material is NOT re-lectured. The FSG's are led by a trained facilitator who has previously taken the course. A survey will be taken during the first week of class to determine the best days and times for most students, and they will begin probably the 2nd or 3rd week of class.

**DPES Chemistry Help Centre:**
The DPES Chemistry Help Centre is located on the 5$^{th}$ floor of the Environmental Science and Chemistry Building in EV502. The help centre will be staffed by a qualified TA three days a week as well as student volunteers. You are strongly encourage to utilize this resource to as much as possible to help you achieve success in CHMA10.

**Assessment and Grading Practices:**

| Graded Work | Weight (%) (NON-LEC60) | Weight (%) (LEC60) |
|---|---|---|
| Learning Catalytics | 5 | N/A |
| Mastering Chemistry Assignments | 5 | 10 |
| Mid-Term | 25 | 25 |
| Final Exam | 40 | 40 |
| Lab | 25 | 25 |
| FINAL MARK | 100 | 100 |

To pass the course, you **MUST** pass the laboratory **AND** either the term test or the final exam (and receive a final grade of 50+, of course!). The laboratory component of CHMA10 is **compulsory**.

**Midterm and Exam Policy:**

*Midterm*

There will be a 90-minute term test around the middle to the end of October that will count as 25% of your final grade. This test will be written outside of class time. The exact date, time and location will be announced as soon as this information is made available from the registrar.

*Final Exam*

There will be a 3-hour, **cumulative** exam written during the end of semester exam period. The exact date, time and location will be announced as soon as they are available. **Please note that if you miss the Final Exam, you must petition the Registrar's Office to write a make-up exam in the next formal exam period.** Check the UTSC Calendar for instructions and deadlines.

*Allowed Aids*

Only non-programmable, non-communicating calculators are allowed in tests and exams for this course (both lecture and lab). Students ***must*** bring their own calculators. Invigilators have the authority to check calculators during the tests and exams.

*Policy on Missed Tests*

Should you miss the term test due to a legitimate reason, you must submit appropriate documentation *within one week of your absence.* If the reason is medical, an official UTSC medical form should be downloaded from http://www.utsc.utoronto.ca/~registrar/resources/pdf_general/UTSCmedicalcertificate.pdf and completed by your doctor. **If no acceptable documentation is received, you will receive a grade of zero for that test.** With a validated absence, the you will be allowed to write a make-up test. Please note that in UTSC Calendar it states: "You cannot petition to withdraw from a course on the grounds that no work was returned to you before the last day to withdraw without academic penalty if this is the result of your having been given an extension to complete your work for reasons relating to you and not the rest of your class."

*Ancillary Fees*

Students taking CHMA10 will be assessed a $20.00 ancillary fee which will cover the cost of chemicals, filter paper, Pasteur pipettes and other items consumed over the course of the lab. For more information regarding ancillary fees students are encouraged to visit the following website: http://www.planningandbudget.utoronto.ca/tuition/Ancillary_Fees.htm

**Academic Integrity**

Academic integrity is one of the cornerstones of the University of Toronto. It is critically important both to maintain our community which honours the values of honesty, trust, respect, fairness and responsibility and to protect you, the students within this community, and the value of the degree towards which you are all working so diligently. Detailed information about how to act with academic

integrity, the Code of Behaviour on Academic Matters, and the processes by which allegations of academic misconduct are resolved can be found online: http://www.artsci.utoronto.ca/osai/students According to Section B of the University of Toronto's Code of Behaviour on Academic Matters http://www.governingcouncil.utoronto.ca/policies/behaveac.htm which all students are expected to know and respect, it is an offence for students to:

- To use someone else's ideas or words in their own work without acknowledging that those ideas/words are not their own with a citation and quotation marks, i.e. to commit plagiarism.
- To include false, misleading or concocted citations in their work.
- To obtain unauthorized assistance on any assignment.
- To provide unauthorized assistance to another student. This includes showing another student completed work.
- To submit their own work for credit in more than one course without the permission of the instructor.
- To falsify or alter any documentation required by the University. This includes, but is not limited to, doctor's notes.
- To use or possess an unauthorized aid in any test or exam.

There are other offences covered under the Code, but these are by far the most common. Please respect these rules and the values which they protect. Offences against academic integrity will be dealt with according to the procedures outlined in the Code of Behaviour on Academic Matters.

**CHMA10H3 Lecture Schedule (*Tentative):**

| Week | Topic(s) | Suggested Reading |
|---|---|---|
| 1 | Introduction to Quantum Model of the Atom | 7.1-7.3 |
| 2 | Quantum Model of the Atom | 7.4-7.7 |
| 3 | Periodic Trends of the Elements | Ch. 8 (excluding Slater's Rules) |
| 4 | pH, Acids and Bases, Precipitation Reactions | 15.6, 4.3-4.5 |
| 5 | Redox Reactions and Stoichiometry | 4.6-4.9 |
| 6 | Gas Laws | 5.1-5.8 (selected material only), 5.10 |
| October 8th-12rd | READING WEEK | N/A |
| 7 | Chemical Bonding I | 9.1-9.8 |
| 8 | Chemical Bonding I / Chemical Bonding II | 9.9-9.10; 10.1-10.2 |
| 9 | Chemical Bonding II | 10.3-10.7 |
| 10 | Chemical Bonding II / Liquids, Solids, Intermolecular Forces | 10.8; 11.1-11.8 |
| 11 | Liquids, Solids, Intermolecular Forces / Nuclear Chemistry | 11.9-11.12; 19.1-19.5 |
| Week 12 | Nuclear Chemistry | 19.6-19.12; |
| December 4th – 6th | Study Break | |
| December 7th -22nd | Final Exam Period | |

**Lecture Topics and Learning Outcomes**

Below is a list of topics that will be covered in this course, along with the corresponding chapters and learning outcomes.

1. **The Quantum-Mechanical Model of the Atom (Chapter 7):** Students will be able to
   i. recognize why quantum mechanics was developed.
   ii. differentiate between the four principle quantum numbers and use them to assign electron configurations for atoms and ions.

2. **Periodic Properties of the Elements (Chapter 8):** Students will be able to
   i. interpret the periodic table based on the electron configuration.
   ii. explain perioidic properties of the elements in the periodic table using the concept of Effective Nuclear Charge, $Z_{eff}$.

3. **Chemical Reactions and Stoichiometry (Chapter 4):** Students will be able to
   i. explain how the pH scale is derived and how acids and bases change the pH of aqueous solutions.
   ii. use the mole concept to balance chemical equations and calculate solution concentration and solution stoichiometry.
   iii. predict solubility of ionic compounds using Solubility rules.

4. **Gases (Chapter 5):** Students will be able to
   a) apply the Ideal Gas Law and Dalton's Law of Partial Pressures to solve problems related to the molar volume, density, and molar mass of a gas.
   b) explain and understand the physical behavior of gases using the Kinetic Molecular Theory.
   c) qualitatively compare and contrast the behavior of real gases and ideal gases.

5. **Chemical Bonding I: Lewis Theory (Chapters 9):** Students will be able to
   a) learn the key concepts related to Lewis theory, such as electron dot structures, octet rule, resonance and formal charges.
   b) Identify and explain ionic, covalent and metallic bonding; calculate lattice energies of ionic compounds.
   c) draw Lewis structures of atoms, ions and simple covalent molecules, as well as resonance structures; assign formal charges and assess competing resonance structures.
   d) compare and rationalize differences in bond length, bond vibrations bond energy and bond polarity.
   e) recognize and understand exceptions of octet rule.

6. **Chemical Bonding II: Molecular Shapes, Valence Bond & Molecular Orbital Theory (Chapter 10):** Students will be able to
   a) learn VSEPR theory and be able to apply VSEPR to describe and predict electron geometry, molecular geometry, and the molecular polarity.
   b) learn the fundamentals about Valence Bond Theory, in particular, the concepts of hybridized atomic orbitals, σ bond and π bond; write hybridization and bonding scheme using Valence Bond Theory.
   c) learn the basic concepts of Molecular Orbital (MO) Theory, especially the linear combination of atomic orbitals (LACOs) approach; understand bonding orbital vs antibonding orbital; draw MO diagram, and predict bond order and magnetism of diatomic molecules.

7. **Liquids, Solids and Intermolecular forces (Chapter 11):** Students will be able to
   a) describe the types of intermolecular forces and use them to explain and understand the physical properties of substances such as surface tension, viscosity and capillary action.
   b) interpret vapor pressure curves and determine heat of vaporization using the Clausius–Clapeyron Equation 2-Point Form.
   c) read and interpret heating curves and perform calcualtions based on data extracted from heating curves.
   d) describe and identify various types of crystalline solids.

8. **Radioactivity and Nuclear Chemistry (Chapter 19) :** Students will be able to
   a) understand major types of radioactivity, including α decay, β decay, γ ray emission, positron emission and electron capture; write nuclear equations of each type of radioactivity.
   b) understand the concept of the Valley of Stability; predict the stability and types of radioactivity of given isotopes.
   c) learn measurements of radioactivity, kinetic of radioactive decay and radiometric dating.
   d) understand nuclear fission and nuclear fusion, and calculate energy associated with nuclear reactions based on mass defect and nuclear binding energy.
   e) learn the safety effects of radiation, and major applications of radioactivity in medicine and energy.

**Laboratory Component of CHMA10**

The laboratory component of CHMA10 is compulsory. The laboratory periods are three hours in length and run every other week. Odd numbered practicals (Week 1 students) start during week of September 10th. Even numbered practicals (Week 2 students) will have their first lab the week of September 17th.

*Lab Manual and Notebook*

A lab manual must be purchased from the UTSC Bookstore before your first lab. You may not use a lab manual from a previous semester: the experiments and course requirements will be different. **DO NOT** wait to purchase your lab manual as it contains a host of important information:

- Lab Schedules and other important dates
- Late and absence policies
- Rules regarding safety
- Appropriate attire for the labs
- Guidelines on how to properly prepare for the lab

The bookstore **DOES NOT** stock enough lab manuals for everyone. If they run out, you **MUST** preorder a copy through the bookstore – this takes time. Failure to adhere to the rules and policies outlined within the lab manual will adversely affect your lab mark – in some instances the impact will be severe. In addition, students will be required to purchase their own lab notebook. The book must be hard-cover, permanently bound (not spiral or loose leaf) with the approximate dimensions 8.25" x 10.5" inches. They can be purchased at the UTSC bookstore; however, students are free to purchase their books at a merchant of their choice (so long as they meet the above requirements).

*Lab Safety*

Safety in the laboratory is an extremely important element in the chemistry program at this University. Failure to follow safe practices can cause laboratory accidents which may result in the loss of time, damage to clothing and other property, and most importantly personal injury. By following suitable precautions, you can anticipate and prevent situations that would otherwise lead to accidents. Students registered in CHMA10H3F will be automatically enrolled in the WHMIS 2015 Training course for the Fall 2018 semester.

Once the course is made available an email announcement will be made and a link to the course will appear in your Quercus home page. As part of this course, students will be expected to watch a couple of videos (approximately 90 minutes long in total) and take a multiple choice quiz on the material you just learned. Students must obtain 80% on the quiz to pass the WHMIS course. **In addition, students will be required to print off your quiz results and present them to your TA before you will be allowed to enter the lab.**

*Safety Equipment*

Students will be required to purchase approved indirect vented chemical splash safety goggles, and a lab coat before attending their first lab. These items can be purchased from both the Environmental and Physical Sciences Student Association (EPSA) and the Biology Student Association (BioSA) or through the bookstore. All safety eyewear must meet either ANSI Z87+ or CSA Z94.3 Standard for high impact protection (if you see one of those standards stamped on your eyewear somewhere then they meet that particular standard). As part of your ancillary fees, all CHMA10H3F students will be provided a pair safety glasses at their first lab session which can be worn during your quizzes and pre-lab discussion; however, when the experiment begins, students will be required to wear their indirect vented chemical splash goggles.

**Labs coats must be 100% cotton – no exceptions.**

Further information regarding appropriate attire please see the guidelines outlined in your lab manual.

**Note that students not wearing approved safety gear will not be allowed to participate in the lab.**

## ABSENCE FROM THE LABORATORY

If you find it necessary to be absent from a laboratory period for any valid reason, you **MUST** contact your TA and/or the Lab Manager (Dr. Scott Ballantyne) the day of your lab via email or phone. If you fail to do so, you will lose 10% off your next lab grade for every day you fail to notify us about of your absence.

There are **NO** make-up labs. In order to be excused from the lab and have the grades exempted from your lab grade students must provide the appropriate documentation (e.g. A UTSC medical certificate signed by a physician or other documentation (e.g. court papers) **within 5 days of the absence**. After the 5 days, the documentation will not be accepted and you will receive a grade of zero for all components of the lab.

If a student misses a lab and provides no reasonable explanation or supporting documentation, a mark of zero will be assigned.

Students must attend at least 3 out of the 5 scheduled experiments in order to be eligible to pass the course.

- Students who miss one experiment, and provide appropriate documentation, the grades for that experiment exempted from their overall lab grade

- If a student misses a second experiment, and provide appropriate documentation, the grades for that experiment will also be exempted from their overall lab grade, *but they will also be required to attend and pass a lab exam which will be worth 20 marks.*
- **If a student misses a third experiment, even if they provide appropriate supporting documentation, they will automatically fail the course.**

If you miss a lab when you are required to hand in material for marking (i.e. Report Sheets), it or a scanned copy must be submitted to the Lab Coordinator within 48 hours of the missed lab. Standard late penalties **(i.e. 10% per day up to 5 days – material submitted after 5 days will be assessed a grade of zero**) will be applied to material submitted after the 48 hr. deadline.

If you submit an electronic copy of your report sheet, the original report sheet must be submitted no later than 1 week after your missed lab. Failure to do so will result in the application of the standard late penalties for every day it is late **(10% per day up to 5 days – material submitted after 5 days will be assessed a grade of zero**).