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 9th, 2020
Office Hours: TBA

Dr. Xiao-an Zhang
Office EV550
Email: xiaoan.zhang@utoronto.ca
Lecturing from the week of October 19th to December 7th, 2020
Office Hours: TBA

Lab Manager
Dr. Nirusha Thavarajah
Office Room Number: ENV402,
Email: nirusha.thavarajah@utoronto.ca
Office Hours: TBA
Email Policy
Please use the following guidelines when sending emails:

i. Use your “utoronto.ca” email 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

Lectures
LEC01, LEC02, LEC60: Mondays, Wednesdays, and Fridays from 12:00 pm – 1:00 pm
We strongly encourage all of you to attend all the lectures to engage in the participatory lessons.

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 schedule, material covered for each test and other important information will be posted on the CHMA10H3 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 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 (run through Quercus)
Facilitated Study Group (FSG) is being run through the Centre for Teaching and Learning. These 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 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.

**Online Tutorial Component of CHMA10**

Online CHMA10 tutorials are designed to help students practice additional problems to meet the learning objectives of each lecture module. The tutorials will be held weekly on Bb Collaborate, starting from the second week of classes. Additional details on the format of the tutorial sessions and schedule will be available on the course Quercus page in the first week of classes. Although, there are no grades associated with the online tutorial sessions, you are strongly encouraged to attend the tutorial sessions for the betterment of your learning.

**Homework 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 link on the Quercus page. Guidelines for registering for Mastering Chemistry will be provided for you on the Quercus course page. For technical support, please contact Pearson directly at [https://support.pearson.com/getsupport/s/](https://support.pearson.com/getsupport/s/). These assignments are worth 8% of your final grade.

**Writing Assignment: Peer Reviewed Mock Journal using PeerScholar**

You will be asked to write an essay with the goal of exploring modern topics in chemistry. You will learn how to utilize both UofT Library resources and Web of Science while also training writing skills. You will convey your research and learning on your topic with a peer-reviewed 500 word essay.

The peer-review process is the cornerstone of writing and communicating new results and ideas in the sciences. A part of this process heavily depends on you! You will be asked to apply critical thinking skills to give and receive feedback to fellow colleagues. You will experience this process while doing this assignment by using PeerScholar and online learning modules that will guide you throughout the various components of the assignment. The assignment will be worth 15% of your final grade. Below is the breakdown of those marks:

<table>
<thead>
<tr>
<th>Completion of Quercus module</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Writing Assignment Guidelines</td>
<td>1%</td>
</tr>
<tr>
<td>Guided Tour of Essay</td>
<td>1%</td>
</tr>
<tr>
<td>Feedback (giving and receiving)</td>
<td>2%</td>
</tr>
<tr>
<td>SciFinder</td>
<td>1%</td>
</tr>
<tr>
<td>References</td>
<td>1%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Essay and Feedback</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Final essay</td>
<td>6%</td>
</tr>
<tr>
<td>Quality and participation in the peer-feedback process</td>
<td>3%</td>
</tr>
</tbody>
</table>

| Total = 15%                                      |        |
You can find much more detail about the writing assignment on the CHMA10 Quercus page.

**Post-Lecture Summaries**
At the end of each week, you will be assigned a quiz where you will be asked to write a concise summary of 250 words or less of the 3 lectures from that week of the course. You may want to write about an important theory or concept. Perhaps you want to outline a particular problems solving technique. Another option would be to give the key points or list one of the challenges you had with the topics being discussed. Each quiz will be available for 7 days. You will be given a grade of 2% of your final grade if you finish 70% of the assigned quizzes. This mark is NOT on a sliding scale. You must complete 70% of the summaries to be awarded the 2% on your final grade.

**Assessment and Grading Practices:**

<table>
<thead>
<tr>
<th>Graded Work</th>
<th>Weight (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Writing Assignment</td>
<td>15</td>
</tr>
<tr>
<td>Homework (Mastering Chemistry)</td>
<td>8</td>
</tr>
<tr>
<td>Post-Lecture Summaries</td>
<td>2</td>
</tr>
<tr>
<td>Mid-Term</td>
<td>20</td>
</tr>
<tr>
<td>Final Exam</td>
<td>35</td>
</tr>
<tr>
<td>Lab</td>
<td>20</td>
</tr>
<tr>
<td>FINAL MARK</td>
<td>100</td>
</tr>
</tbody>
</table>

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 term test around the middle to the end of October that will count as 20% of your final grade. This test will be written outside of class time. The exact date and time will be announced as soon as this information is made available from the registrar. The midterm will be administered online via Quercus.

**Final Exam**
There will be a **cumulative** exam written during the end of semester exam period. The exact date and time 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. The final exam will be administered online via Quercus.

**Allowed Aids**
Only non-programmable, non-communicating calculators are allowed in tests and exams for this course (both lecture and lab). Students **must** use their own calculators.
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, 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."

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: https://www.academicintegrity.utoronto.ca/

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):**

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic(s)</th>
<th>Suggested Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction to Quantum Model of the Atom</td>
<td>7.1-7.3</td>
</tr>
<tr>
<td>2</td>
<td>Quantum Model of the Atom</td>
<td>7.4-7.7 (excluding Particle in a Box)</td>
</tr>
<tr>
<td>3</td>
<td>Periodic Trends of the Elements</td>
<td>8.1 – 8.9</td>
</tr>
<tr>
<td>4</td>
<td>pH, Acids and Bases, Precipitation Reactions</td>
<td>15.6; 4.3-4.5</td>
</tr>
<tr>
<td>5</td>
<td>Redox Reactions and Stoichiometry</td>
<td>4.6-4.9</td>
</tr>
<tr>
<td>6</td>
<td>Gas Laws</td>
<td>5.1-5.10</td>
</tr>
<tr>
<td></td>
<td>October 10th-16th</td>
<td>READING WEEK</td>
</tr>
<tr>
<td>7</td>
<td>Introduction to Enthalpy of Reactions Chemical Bonding I</td>
<td>6.8-6.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Chemical Bonding I / Chemical Bonding II</td>
<td>9.9-9.10; 10.1-10.2</td>
</tr>
<tr>
<td>9</td>
<td>Chemical Bonding II</td>
<td>10.3-10.7</td>
</tr>
<tr>
<td>10</td>
<td>Chemical Bonding II / Liquids, Solids, Intermolecular Forces</td>
<td>10.8; 11.1-11.8</td>
</tr>
<tr>
<td>11</td>
<td>Liquids, Solids, Intermolecular Forces / Nuclear Chemistry</td>
<td>11.1 - 11.8</td>
</tr>
<tr>
<td>Week 12</td>
<td></td>
<td>Nuclear Chemistry</td>
</tr>
<tr>
<td>December 3rd– 5th</td>
<td></td>
<td>Study Break</td>
</tr>
<tr>
<td>December 6th -21st</td>
<td></td>
<td>Final Exam Period</td>
</tr>
</tbody>
</table>
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. Explain the need for the development of the quantum mechanical model of the atom and the key scientists who made major contributions to its development.
   ii. describe the evidence for the wave/particle duality of electrons and photons.
   iii. Be able to describe the electronic configuration of an atom or ion using the four quantum numbers.
   iv. Recognize how the quantum mechanical model of the atom is reflected in how the periodic table is organized.
   v. Use Hund’s rule and the Aufbau principle to write electron configurations for atoms and ions.

2. Periodic Properties of the Elements (Chapter 8): Students will be able to
   i. Write electron configurations from the periodic table and relate quantum numbers to the location of elements in the periodic table.
   ii. Estimate the effective nuclear charge, Zeff, and use it to explain and predict trends in:
       • Atomic size
       • Ionic size
       • Relative ionization energies
       • Electron affinity
   iii. Recognize periodic behavior of the elements.
   iv. Identify the three main types of chemical bonds and how to classify them based on electronegativity

3. Chemical Reactions and Stoichiometry (Chapter 4): Students will be able to
   i. Explain the pH scale and how it relates to water at equilibrium.
   ii. Recognize and balance different types of chemical reactions including:
       i. Acid/base
           • Identify strong acids and bases and write balanced neutralization reactions as well as reactions that evolve gases.
       ii. Precipitation
           • Predict solubility and write precipitation reactions
   iii. Redox
   iv. Identify oxidations states and balance redox reaction in both acid and base solution.
   v. Determine the limiting reagent in a reaction as well as calculating the theoretical and percent yields.
vi. Determine solution concentrations and dilutions molarity.

4. Gases (Chapter 5): Students will be able to
   i. Rationalize the macroscopic properties of gases in terms of the kinetic molecular theory
   ii. Explain the relationships between temperature, volume, pressure and quantity in terms of the kinetic molecular theory
   iii. Interpret barometer and manometer readings
   iv. Use the gas law equations to calculate pressure, temperature, volume, density, molar mass and/or amount of gas in both static and changing systems
   v. Solve stoichiometry problems involving gases
   vi. Apply the ideal gas law and Dalton’s law of partial pressures to solve for properties of gas mixtures, including gas samples collected over water
   vii. Predict relative rates of diffusion/effusion for different gases and/or temperatures; use relative diffusion/effusion rate data to calculate relative molecular masses/molecular speeds
   viii. Interpret non-ideal behaviour of gases in terms of the kinetic molecular theory and its shortcomings; predict the extent of non-ideal behaviour for different gas samples
   ix. Calculate properties for real gases using the van der Waals gas equation

5. Thermochemistry (Chapter 6): Students will be able to
   a) Apply Hess’s Law to calculate changes in enthalpy from $\Delta H$ of a reaction or from standard enthalpies of formation.

6. 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.

7. Chemical Bonding II: Molecular Shapes, Valence Bond & Molecular Orbital Theory (Chapter 10): Students will be able to
   i. learn VSEPR theory and be able to apply VSEPR to describe and predict electron geometry, molecular geometry, and the molecular polarity.
   ii. learn the fundamentals about Valence Bond Theory, in particular, the concepts of hybridized atomic orbitals, $\sigma$ bond and $\pi$ bond; write hybridization and bonding scheme using Valence Bond Theory.
iii. 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.

8. 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 calculations based on data extracted from heating curves.

9. Radioactivity and Nuclear Chemistry (Chapter 19) : Students will be able to
   i. 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.
   ii. understand the concept of the Valley of Stability; predict the stability and types of radioactivity of given isotopes.
   iii. learn measurements of radioactivity, kinetics of radioactive decay and radiometric dating.
   iv. understand nuclear fission and nuclear fusion, and calculate energy associated with nuclear reactions based on mass defect and nuclear binding energy.
   v. learn the safety effects of radiation, and major applications of radioactivity in medicine and energy.
Online Laboratory Component of CHMA10
The goals of this virtual lab program are to train you on safe laboratory practices and help you understand the fundamental chemistry laboratory techniques. The laboratory modules are designed to navigate you through safety training and the experiments. The experiment modules are designed to teach the theory and lab techniques, and assess your knowledge. Labs are directly or indirectly connected to the first-year chemistry content. As part of the pre-lab work, you may be expected to read recommended sections from the textbook.

The synchronous session of the virtual lab will commence 10 min past the hour of the scheduled time for your practical on Bb Collaborate. You are encouraged to arrive on time for your assigned session. The synchronous laboratory periods are 60 min in length and run every other week. If you are unable to attend the synchronous lab session during the scheduled hours, you can watch the recorded sessions after every lab to follow up with the instructions and complete the assigned tasks. It is mandatory pass the lab component of the course in order to be eligible to pass the course. The lab component is worth 20% of your course grade.

Lab Manual and Notebook
The lab manual will be setup as modules on the course Quercus platform. You may not use a lab manual from a previous semester: the experiments and course requirements will be different. Students are required to maintain an electronic notebook. More details on the online e-notebook will be provide on the online lab module.

Laboratory Marking Scheme
The laboratory component is worth 20% of your final grade. The laboratory component is marked out of 100 total marks: 80 marks reserved for the 5 labs and 20 marks reserved for the end of the term oral lab exam.

<table>
<thead>
<tr>
<th>Component</th>
<th>% of final grade</th>
<th>Marks out of 100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Lab Quiz (available online 3 days before your lab):</td>
<td>5 %</td>
<td>6 marks (x 5)</td>
</tr>
<tr>
<td>Post Lab Report Sheets</td>
<td>7.5 %</td>
<td>8 marks (x 5)</td>
</tr>
<tr>
<td>Lab Notebook</td>
<td>2.5 %</td>
<td>10 marks (x 1)</td>
</tr>
<tr>
<td>Oral Lab Exam</td>
<td>5.0 %</td>
<td>20</td>
</tr>
<tr>
<td>Total Marks:</td>
<td><strong>20 %</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

**You must receive a passing grade in the laboratory section in order to pass the course**
**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.

Even though, you are not attending the lab practical in person this academic term, it is mandatory that you understand the safety lab practices to apply in future chemistry labs. Students registered in CHMA10H3F will be automatically enrolled in the WHMIS Training course. Once the WHMIS course is made available, an email announcement will be sent and a link to the course will appear in your Quercus home page. As part of this course, you will be expected to watch a couple of safety videos (approximately 90 minutes long in total) and take a multiple-choice quiz on the information covered in the videos. You must obtain 80% on the quiz to pass the WHMIS course. In addition, you will be required to print off your quiz results and e-mail them to your TA before the start of your first lab period.

**Absence from the Synchronous Lab Session**

If you are unable to attend the synchronous lab session online due to time zone difference or for any other valid reason you must give ahead notice to the Lab Manager, Dr. Nirusha Thavarajah (nirusha.thavarajah@utoronto.ca) and you are responsible for watching the recorded lab sessions and completing the experimental modules on time to meet the due dates in Eastern Standard Time (EST). There are no make-up synchronous lab sessions. **Late submission of any pre or post lab assessments will not be accepted.**

If you are unable complete the pre- or post-lab assignments due to a valid reason (e.g. medical), you must provide the appropriate documentation (e.g. A UTSC medical certificate signed by a physician) **within 5 days of the due date of the assignment** for consideration to be excused from the lab assignment and have the grade weight added onto the oral lab exam. 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 assignment and provides no reasonable explanation or supporting documentation, a mark of zero will be assigned.*

Students must complete at least 3 out of the 5 lab modules in order to be eligible to pass the course.

- If a student misses one experiment module assessments (pre & post), and provides appropriate documentation, the weight of that experiment will be added onto the oral lab exam.
- If a student misses two experimental module assessments (pre & post), and provides appropriate documentation, the weight of both experiments will also be added onto the oral lab exam.
- **If a student misses a third experimental lab module, even if they provide appropriate supporting documentation, they will automatically fail the lab component and therefore will automatically fail the course.**