

Chemistry 0012B - Introductory Chemistry II

Course Outline

Winter 2019

Course Description

Chemistry 0012 is an interactive course, exploring the thermodynamics, kinetics and equilibrium of chemical reactions. The behaviour of ideal gases and interpretation of redox reactions will also be explored. Students will engage in problem solving and apply laws and theories to analyze chemical reactions that support our society with heat, batteries, buffers, and important materials. This course examines many Ontario Grade 12 U chemistry topics, and in combination with Chemistry 0011, provides the equivalency to the Ontario Grade 12 U level chemistry.

Antirequisite(s): Grade 12 U Chemistry

Prerequisite(s): Chemistry 0011

Instructor and Course Information

Instructor: Dr. Christina Booker

Email: cbooker2@uwo.ca

Office Hours: TBA, based on student schedules

The best way to contact me is through email. You can expect a reply within 48 hours, excluding weekends/holidays. Please be sure to email from your @uwo.ca account, and use "CHEM 0012" in the subject line to ensure that the email reaches me.

Lectures/Tutorials: Tuesdays 8:30 am – 11:30 am, BR-UH27

Lectures and tutorials will be integrated in the above class times, rather than having distinct "lecture" or "tutorial" times. Lectures/Tutorials will be interactive. Please arrive ready to engage your mind, work through example problems, and discuss problems.

Laboratories: Tuesdays 4:30 pm – 6:30 pm, MRW 156

Laboratories will occur every few weeks, and a detailed schedule will be posted on the course OWL page. Labs are an essential component to this course – allowing you to enhance your lab skills and experience concepts that are discussed in class.

Course Learning Outcomes

By the end of this course, students will be able to:

- **Explain** the rationale for the chemistry theories discussed during the course through *Critical Thinking & Analysis Questions, Online Discussions* and *Tests/Exam*
- **Apply** appropriate laws and theories to solve chemical problems through *Lab Reports, Critical Thinking & Analysis Questions*, and *Tests/Exam*
- **Discuss** how the chemical laws and theories in this course apply to the world around us in the *Chemistry in the News Assignment*
- **Reflect** on their learning progress in the *Learning Reflection* assignments and make appropriate adjustments to master the problems presented
- **Demonstrate** appropriate lab skills and safety procedures during laboratories

Topic-Specific Learning Outcomes

By the end of this course, students will be able to:

Topic 1: Gases

- Use the Combined Gas Law and the Ideal Gas Law to carry out calculations involving one gas or a mixture of non-reacting gases
- Interpret the behaviour of ideal gases using the Kinetic Molecular Theory
- Identify the forces that account for differences between an ideal and real gas

Topic 2: Thermodynamics

- Calculate the energy changes involved in various processes such as heating, cooling, changes of state and chemical reactions
- Use Hess's Law to determine the enthalpy change for a reaction
- Write formation reactions and use these standard heats of formations to predict the enthalpy change for a new reaction
- Use calorimetry to determine the heat of a reaction
- Describe entropy and Gibb's Free Energy and use these values to predict if a reaction is spontaneous

Topic 3: Kinetics

- Explain the factors affecting the rate of a reaction using Collision theory
- Determine the rate law for a specific reaction given appropriate data and identify the order of that reaction, the intermediates and any catalysts
- Calculate the half life time or concentrations involved in first order reactions
- Interpret and apply the Arrhenius equation to appropriate problems

Topic 4: Chemical Equilibrium

- Determine the equilibrium constant and equilibrium expression based on experimental data
- Predict the direction in which a reaction will proceed using Le Chatelier's Principle and the reaction quotient
- Write the equilibrium expression and calculate the amounts of each species present in an equilibrium using equilibrium constants for situations involving low solubility salts, weak acids, weak bases, salts or buffer solutions
- Identify various titration curves and select an appropriate indicator for a titration
- Identify acids, weak acids, bases, weak bases and salts, including conjugate species, write equilibrium equations for these species, and predict the relative pH for a solution of this substance
- Identify the components and value of a buffer solution, and perform calculations to determine the pH and amounts of components in this solution

Topic 5: Redox Reactions

- Determine the oxidation state of an element
- Interpret a redox reaction by identifying the species being oxidized and reduced
- Balance redox reactions
- Identify and describe the importance of each part of an electrochemical cell and write cell notations
- Predict the spontaneity of a reaction based on its cell potential (given, or calculated)
- Calculate current, time or the amount of product in an electrolytic process using Faraday's Law
- Describe the types and chemical processes in primary and secondary batteries
- Explain the issue and chemical process of corrosion

Laboratories

- Correctly use lab equipment such as burettes, mass balances, and pipettes
- Accurately record pertinent observations while following written instructions in a lab setting
- Use experimental data to complete calculations using the correct number of significant figures
- Compare their data to 'real' data and make constructive suggestions as to why there may be differences
- Identify and use appropriate lab safety equipment and procedures

Required Materials

All of the following materials are available at the Western Bookstore:

Chemistry 0012 Course Notes Winter 2019

Chemistry 0012 Lab Manual Winter 2019

Lab Coat and scientific calculator (safety glasses will be provided during the lab)

Course Evaluation

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|---|--------------|
| Lab Reports (4 Reports x 3.75 %) | 15.0 % |
| Critical Thinking & Analysis Questions (In-Class, weekly) | 10.0 % |
| Chemistry in the News Online Discussion Assignment | 5.0 % |
| Learning Reflection (2 Reflections x 2.0 %) | 4.0 % |
| Test #1 (Tuesday, February 5 th , first hour in class) | 15.0 % |
| Test #2 (Tuesday, March 12 th , first hour in class) | 16.0 % |
| Final Exam (3 h, scheduled by the Registrar) | 35.0 % |
| <i>Bonus – Online Problem Discussion</i> | <i>1.0 %</i> |

You must pass the laboratory portion of the course to pass the course (mark $\geq 7.5 / 15$). All the labs count toward the lab mark. None are 'dropped'.

Lab Reports

A pre-lab assignment must be handed in at the beginning of the lab session and will count towards the lab report grade for that lab. It is required that the **pre-lab is completed and submitted** for you to be able to perform the lab. Data for the lab report will be collected during the lab session and **recorded on the lab report** during the lab session. Analysis, calculations and conclusions can be completed during the lab, or after the lab session. It is expected that the data for lab partners will be the same. However, the analysis, calculations, and conclusions must be completed in each student's own words. Direct copying of your lab partner's report or pre-lab exercise is considered plagiarism and will be followed up according to Brescia University College plagiarism policy.

Lab reports are due in class the following Tuesday after the lab session, except for Experiment #4, which will be due at the end of the lab.

- Experiment #1 – Thermochemistry – Calorimetry and Hess's Law
- Experiment #2 – Kinetics – A Study of Reaction Rates
- Experiment #3 – Examining Equilibrium Systems
- Experiment #4 – Redox Reactions

Critical Thinking & Analysis Questions

The iClicker software, accessible through the OWL course page, will be used to collect your responses to critical thinking, analysis, and discussion questions which will be posed throughout most of the lectures. This is a free (to you) software that is supported by the institution. Thus, rest assured your personal information and privacy will be protected. Also know that data gathered using this software will not be used for research purposes without the express written permission of the student. *Physical clicker devices will not be used.* Instead, any WiFi-enabled device (phone, tablet, computer) can be used to submit responses and will act as your "Personal Response System". You must set up an account (link through the OWL course page) in order to access the questions, and you will use this same account throughout the year. We will discuss how to set up this account during the first week of class. **Please note that Brescia has WiFi access in the classrooms**, so you will not need to use up your personal data package to respond to questions.

If you do not have an electronic device you can still participate in the *Critical Thinking & Analysis Questions* and earn a grade for this evaluation component! A pdf response sheet can be printed off the OWL course page and brought to class. You can record your responses in pen on this sheet during the lecture and submit this to me at the conclusion of the class. Please note – these paper forms will *only* be accepted immediately following the class in which the questions were asked, and must be written on the official printout from the course OWL site. If you have any questions on how to meet these requirements, I am happy to discuss them with you.

The purpose of this evaluation component is to encourage you to engage your mind in the material we discuss during class. This will also prompt conversations amongst the class to discuss the concepts and problems proposed during lecture. It is all too easy to nod along while an “expert” demonstrates how to solve a problem. Learning improves when you challenge yourself to *think* during class, for example, by predicting the next step of a problem solving strategy, analyzing *why* an answer is correct or incorrect, or identifying a rational response based on the theory discussed.

In order to assign a grade for this component, 2 points will be given for a correct answer, 1 point will be given for an incorrect answer (as attempts and learning from errors IS valuable!), and 0 points will be given for no response. If you are absent from class, your non-responses will fit in the “no response” category for those questions and earn a grade of 0. It is understandable that sickness and other commitments may keep you from the occasional class, and thus, the grading scheme below has **built-in accommodation** for the occasional absence, as well as any technical difficulties you may encounter during the term. Thus, *additional* accommodation will *not* be granted to make-up this grade. There will be many questions posed throughout the year, so you will have ample opportunity to demonstrate your analysis and critical thinking. Grades will be posted on a regular bases for you to monitor your progress. At the conclusion of the course, the final 10% evaluation component will be calculated as follows:

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|-----------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|---|
| Percentage of Possible Points (%) | ≥80 | ≥75 | ≥70 | ≥60 | ≥50 | ≥40 | ≥30 | ≥20 | ≥10 | ≥5 | 0 |
| Grade Achieved | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

Chemistry in the News Online Discussion Assignment

The purpose of this assignment is to have you discover how chemistry is integrated into the day-to-day world around us. As well, this assignment gives you an opportunity to apply your chemistry knowledge to a current issue, find and reference scholarly sources, and even evaluate the findings of an article. Your task will be to find a current news article that is somehow related to a topic we discuss in Chem 0012 and prepare a 300-word review of this article following the expectations and guiding questions provided. You will then post your discussion on the OWL course page and reply to your classmate’s posts during the term. Guidelines for your post and replies, as well as due dates and grading will be posted on OWL.

Learning Reflection

Following each test, you will submit a brief reflection on your learning process, study habits, and goals for the course. You will also analyze your performance on the test. The purpose of this assignment is to identify your strengths and weaknesses in this course, assess yourself on your progress, and discuss any changes you want to implement to succeed in the course. You will receive feedback on your reflection to support your success in this course. This reflective process is part of one of the Brescia competencies. Specific questions for you to answer will be provided for each reflection. These assignments will be submitted via OWL.

Tests and Exams

Two tests and one final exam will be given to examine your understanding and application of the course content. Tests and the final exam will consist of multiple choice and short answer questions. Tests will be held in class for one hour, while the final exam will be scheduled by the Registrar for 3 hours. These tests/exam are closed book, but you are permitted a scientific, non-programmable calculator. A reference sheet with formulas will be provided as needed, and you will be informed of this reference sheet prior to the test/exam. The content range covered on the test will be announced in class and on the OWL course page a week prior to the test. The final exam will be cumulative.

Bonus – Online Problem Discussion

You may select one of the designated “Problem Discussion” problems in the course notes and post a *video* or *audio recording with an image* describing how to solve the problem on VoiceThread (through our course OWL site). One post that meets the expectations posted on OWL is worth a bonus 1% of your course grade! Note, only the *first* post on a given problem will receive credit.

Suggestions for Success

Plan to attend every class – we will discuss concepts thoroughly with many examples, so it is in your best interest to be present, attentive and engaged! Please bring your Course Notes, a WiFi-enabled device (or a printout response sheet) and a calculator to class as we will complete examples directly in your Course Notes package. Many iClicker questions will be posed for individual analysis and small group problem solving.

This is a problem-solving course. Lots of examples are available for you to follow in the Course Notes. However, it is very difficult to do well in this course without **doing the problems on your own**. There are lots of questions in the Course Notes. The final answers to most of the questions are given in the course notes and the **full solutions are on course website**. However - **do not just read the solutions!** This will not assist you in gaining problem solving skills or assessing your understanding. Begin, progress through, and conclude as many questions as you need to grasp the concept. Consider all the practice problems to be “assigned homework”. Chemistry textbooks will be available in the library as reference. This course has a heavy workload and it can be difficult to catch up once you fall behind – so do your best to stay on top of the practice problems!

If you are having trouble with any of the concepts, please ask for help as soon as possible. Some topics are easier to explain in person, so I am happy to meet with you to discuss any areas of difficulty. You can also post simpler questions to the OWL discussion page under the appropriate topic. Students are free to answer these content questions, and I will moderate them as well.

Chem 0012 Policies and Expectations

Laboratory Requirements

A lab coat is mandatory and may be purchased at the Western bookstore. Safety Glasses will be provided.

Dress Code: A lab coat, long pants (must come to the ankles), socks that cover the ankles, and closed shoes are mandatory. Hair must be tied back, if possible. Due to your personal safety, students who are not dressed according to this code must be asked to leave the lab and a mark of zero will be assigned for that lab.

Attendance: All labs count toward the lab mark. ***Any student who is more than 5 minutes late will not be permitted to do the experiment*** since important information will be discussed at the beginning of the session. The clock in the lab will be used as the basis for this decision. Please contact academic counseling if you miss a lab due to illness or other extenuating circumstances.

Code of Conduct

The learning environment for Chem 0012 will be supportive, challenging, and respectful. This will be a safe environment to ask questions and take a chance on an unsure answer. As the instructor, I will treat you with respect, and I expect the same respect to be demonstrated by all students. We will develop a set of classroom expectations during the first week of class.

Communication

Students will receive email at their @uwo.ca address only. Schedules and important information will be posted on the OWL course page. Please check for email and website updates on a regular basis.

All online discussions on the OWL course page and emails are expected to be written in a respectful tone and with professional style. For example, "This idea sucks" is an inappropriate comment, while a better response could be "This idea contradicts the First Law of Thermodynamics and thus I propose the temperature will increase rather than decrease." For another example, "Can u help me i dont no how" is not acceptable, while a professional style could be, "Dear Dr. Booker, I am confused about how to calculate the equilibrium constant. Can we meet to chat about this after class on Wednesday? Thanks, Anusha"

Absences

If you must be absent from a class, please contact a classmate to obtain the notes for the examples you have missed. If you have any questions, feel free to ask me.

Absence from a lab, test, or exam must be dealt with by academic counseling. Documentation will be required for accommodation to be provided. If you are excused from a lab or test, your grade will mostly likely be reweighted towards the other labs/tests. If you are excused from the final exam, you will be required to write the Special Exam or next available final exam. Please see the Brescia policies below.

If you are absent from class when a "Critical Thinking and Analysis Question" is asked, you will receive 0 points for this question. As discussed above, the grading scheme for these questions makes allowance for occasional absences and technical difficulties. Since ample opportunity will be given to respond to these questions, additional grading accommodations will not be provided for occasional absences.

Late Assignments

Your assignments and lab reports will be deducted 10% per day late, and to the other students. If extenuating circumstances arise, please contact me via email. If documentation is requested, you must submit your documentation to your academic counsellor to support your case.

Guidelines for Students on the Use of Personal Response Systems

We will be using iClicker, which is integrated into OWL, and using personal WiFi-enabled devices rather than physical "clickers". *Please note that entering responses on another student's iClicker account constitutes a scholastic offence.* The following policies are provided for your reference:

Personal Response Systems (“clickers”) may be used in some classes. If clickers are to be used in a class, it is the responsibility of the student to ensure that the device is activated and functional. Students must see their instructor if they have any concerns about whether the clicker is malfunctioning. Students must use only their own clicker. If clicker records are used to compute a portion of the course grade:

- the use of somebody else’s clicker in class constitutes a scholastic offence,
- the possession of a clicker belonging to another student will be interpreted as an attempt to commit a scholastic offence.

2018-2019 BRESCIA UNIVERSITY COLLEGE ACADEMIC POLICIES AND REGULATIONS

1. POLICY REGARDING MAKEUP EXAMS AND EXTENSIONS OF DEADLINES

When a student requests academic accommodation (e.g., extension of a deadline, a makeup exam) for work representing 10% or more of the student’s overall grade in the course, it is the responsibility of the student to provide acceptable documentation to support a medical or compassionate claim. All such requests for academic accommodation **must** be made through an Academic Advisor and include supporting documentation.

Academic accommodation for illness will be granted only if the documentation indicates that the onset, duration and severity of the illness are such that the student could not reasonably be expected to complete her academic responsibilities. Minor ailments typically treated by over-the-counter medications will not normally be accommodated.

Students must submit their documentation along with a request for relief specifying the nature of the accommodation being requested no later than two business days after the date specified for resuming responsibilities. In cases where there might be an extended absence or serious issue, students should submit their documentation promptly and consult their Academic Advisor for advice during their recovery period. Whenever possible, students who require academic accommodation should provide notification and documentation in advance of due dates, examinations, etc. Appropriate academic accommodation will be determined by the Dean’s Office/Academic Advisor in consultation with the student’s instructor(s). Academic accommodation may include extension of deadlines, waiver of attendance requirements for classes/labs/tutorials, arranging Special Exams or Incompletes, re-weighting course requirements, or granting late withdrawals without academic penalty

Please note that personal commitments (e.g., vacation flight bookings, work schedule) which conflict with a scheduled test, exam or course requirement are **not** grounds for academic accommodation.

A UWO Student Medical Certificate (SMC) is **required** if a student is seeking academic accommodation on medical grounds. This documentation should be obtained at the time of the initial consultation with the physician/nurse practitioner or walk-in clinic. A SMC can be downloaded from: http://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf . The student must request documentation sufficient to demonstrate that her ability to meet academic responsibilities was seriously affected. Please note that under University Senate regulations documentation stating simply that the student “was seen for a medical reason” or “was ill” is **not** adequate to support a request for academic accommodation.

The full policy on requesting accommodation due to illness can be viewed at:

http://www.westerncalendar.uwo.ca/PolicyPages.cfm?Command=showCategory&PolicyCategoryID=1&SelectedCalendar=Live&ArchiveID=#Page_12

2. ACADEMIC CONCERNS

If you feel that you have a medical or personal challenge that is interfering with your work, contact your instructor and Academic Advisor as soon as possible. Problems may then be documented and possible arrangements to assist you can be discussed at the time of occurrence rather than on a retroactive basis. Retroactive requests for academic accommodation on medical or compassionate grounds are not normally considered.

If you think that you are too far behind to catch up or that your work load is not manageable, you should consult your Academic Advisor. If you consider reducing your workload by dropping one or more courses, this must be

done by the appropriate deadlines (refer to the Registrar's website, <http://brescia.uwo.ca/academics/registrar-services/> or the list of official sessional dates in the Academic Calendar, see the Sessional Dates tab at <http://www.westerncalendar.uwo.ca/index.cfm?SelectedCalendar=Live&ArchiveID=>). You should consult with the course instructor and the Academic Advisor who can help you consider alternatives to dropping one or more courses. *Note that dropping a course may affect OSAP eligibility and/or Entrance Scholarship eligibility.*

3. ABSENCES

Short Absences: If you miss a class due to a minor illness or other problems, check your course outline for information regarding attendance requirements and make sure you are not missing a test or assignment. Cover any readings and arrange to borrow notes from a classmate. Contact the course instructor if you have any questions.

Extended Absences: If you have an extended absence, you should contact the course instructor and an Academic Advisor. Your course instructor and Academic Advisor can discuss ways for you to catch up on missed work and arrange academic accommodations, if appropriate and warranted.

It is important to note that the Academic Dean may refuse permission to write the final examination in a course if the student has failed to maintain satisfactory academic standing throughout the year or for too frequent absence from the class or laboratory (http://www.westerncalendar.uwo.ca/PolicyPages.cfm?Command=showCategory&PolicyCategoryID=5&SelectedCalendar=Live&ArchiveID=#SubHeading_68).

4. SCHOLASTIC OFFENCES

Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at: http://www.westerncalendar.uwo.ca/PolicyPages.cfm?Command=showCategory&PolicyCategoryID=1&SelectedCalendar=Live&ArchiveID=#Page_20 .

Students are responsible for understanding the nature of and avoiding the occurrence of plagiarism and other academic offences. Note that such offences include plagiarism, cheating on an examination, submitting false or fraudulent assignments or credentials, impersonating a candidate, or submitting for credit in any course without the knowledge and approval of the instructor to whom it is submitted, any academic work for which credit has previously been obtained or is being sought in another course in the University or elsewhere. Students are advised to consult the section on Scholastic Discipline for Undergraduate Students in the Academic Calendar.

If you are in doubt about whether what you are doing is inappropriate or not, consult your instructor, the Academic Dean's Office, or the Registrar. A claim that "you didn't know it was wrong" is not accepted as an excuse.

The penalties for a student guilty of a scholastic offence (including plagiarism) include refusal of a passing grade in the assignment, refusal of a passing grade in the course, suspension from the University, and expulsion from the University.

Plagiarism:

Students must write their essays and assignments in their own words. Whenever students take an idea or a passage from another author, they must acknowledge their debt both by using quotation marks where appropriate and by proper referencing such as footnotes or citations. Plagiarism is a major academic offence.

All required papers may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (<http://www.turnitin.com>).

Computer-marked Tests/exams:

Computer-marked multiple-choice tests and/or exams may be subject to submission for similarity review by software that will check for unusual coincidences in answer patterns that may indicate cheating. Software

currently in use to score computer-marked multiple-choice tests and exams performs a similarity review as part of standard exam analysis.

5. PROCEDURES FOR APPEALING ACADEMIC EVALUATIONS

All appeals of a grade must be directed first to the course instructor. If the student is not satisfied with the decision of the course instructor, a written appeal is to be sent to the School Chair. If the response of the Chair is considered unsatisfactory to the student, she may then submit a written appeal to the Office of the Dean. If the student is not satisfied with the decision of the Dean, she may appeal to the Senate Review Board Academic (SRBA), if there are sufficient grounds for the appeal. For information on academic appeals you can consult your Academic Advisor or see the Student Academic Appeals – Undergraduate in the Academic Calendar

http://www.westerncalendar.uwo.ca/PolicyPages.cfm?Command=showCategory&PolicyCategoryID=1&SelectedCalendar=Live&ArchiveID=#Page_14.

Note that final course marks are not official until the Academic Dean has reviewed and signed the final grade report for the course. If course marks deviate from acceptable and appropriate standards, the Academic Dean may require grades to be adjusted to align them with accepted grading practices.

6. PREREQUISITES

Unless you have either the prerequisites for a course or written special permission from the Dean to enroll in it, you will be removed from the course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisite(s).

7. SUPPORT

Support Services

The Brescia University College Registrar's website, with a link to Academic Advisors, is at <http://brescia.uwo.ca/academics/registrar-services/> . The website for the Student Development Centre at Western is <http://www.sdc.uwo.ca/> .

Mental Health and Wellness

Students may experience a range of issues that can cause barriers to your learning, such as increased anxiety, feeling overwhelmed, feeling down or lost, difficulty concentrating and/or lack of motivation. Services are available to assist you with addressing these and other concerns you may be experiencing. You can learn more about mental health and wellness at Brescia at <http://brescia.uwo.ca/life/mental-health-wellness/>. Students who are in emotional/mental distress should refer to Health and Wellness at Western, http://uwo.ca/health/mental_wellbeing/index.html, for information about how to obtain help for yourself or others.

Sexual Violence

All members of the Brescia University College community have a right to work and study in an environment that is free from any form of sexual violence. Brescia University College recognizes that the prevention of, and response to, Sexual Violence is of particular importance in the university environment. Sexual Violence is strictly prohibited and unacceptable and will not be tolerated. Brescia is committed to preventing Sexual Violence and creating a safe space for anyone in the Brescia community who has experienced Sexual Violence.

If you or someone you know has experienced any form of Sexual Violence, you may access resources at <http://brescia.uwo.ca/life/sexual-violence/>.

Portions of this document were taken from the Academic Calendar, the Handbook of Academic and Scholarship Policy and the Academic Handbook of Senate Regulations. This document is a summary of relevant regulations and does not supersede the academic policies and regulations of the Senate of the University of Western Ontario.