Chemistry 2210A
Chemistry of the Environment
Course Outline Fall 2019

This document provides you with important information regarding this course. Please refer to this document throughout the term.

Course Description
Explore the current and future impact of human activity on our environment from a chemical perspective. Analyze the chemistry behind topics such as air pollution, climate change, fossil fuels, nuclear and other power sources, the ozone hole, and water purification.

Course Instructor
Dr. Christina Booker, PhD
Email: cbooker2@uwo.ca
Office: Room 21 (Ground Floor), Chemistry Building, Western University
Office Hours: Fridays, 12:00 pm – 1:00 pm or by appointment scheduled via email.

Email is the best way to contact me (your instructor). Although I will often reply within one day, please allow up to 48 hours. Please email from your @uwo.ca account and use “CHEM 2210 – Email Topic” in the subject line to ensure that your email reaches me.

Class Information
Section: 001
Class Time: Mondays, Wednesdays & Fridays, 1:30 – 2:20 pm
Location: MC-105B

Requisites
The prerequisites for Chemistry 2210A are: Chemistry 1301A/B and 1302A/B; OR Chemistry 1301A/B and Integrated Science 1001X; OR the former Chemistry 1100A and 1200B.
The antirequisites for Chemistry 2210A are: CEE 2217A/B AND Chemistry 4491E.

Unless you have either the prerequisites for this course or written special permission from your Dean to enroll in it, you may be removed from this 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 prerequisites.

Accessibility
Please contact the course instructor if you require material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Accessible Education (formerly Services for Students with Disabilities) at 661-2147 or http://www.sdc.uwo.ca/ssd/ if you have questions regarding accommodation.
Course Website

News, course updates, discussion forums, and lecture notes will be posted on Western’s OWL system (http://owl.uwo.ca), under our OWL course page. This is the primary method by which information will be distributed to all students in the course. You are responsible for checking OWL on a frequent basis to stay informed. Every effort will be made to post lecture notes by 6 pm the day prior to the related class.

Learning Outcomes

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

- Describe the impact of human activity on our environment, especially with respect to the use of chemicals and fossil fuels, through Critical Thinking in Class (iClicker), and Tests/Exam.
- Summarize key chemistry processes occurring in the environment to a first-year science student audience through the Group Infographic Assignment.
- Analyze current news articles related to environmental chemistry issues through the Chemistry in the News Online Discussion.
- Describe how ozone is created and destroyed in the natural, unpolluted atmosphere. Demonstrate how man-made chemicals interfere with natural processes to create ozone ‘holes’ and the impact of these on all living species. (Unit 1&2)
- Identify the root causes and consequences of polluted air. (Unit 3&4)
- Explain the natural greenhouse effect and how the temperature of the planet is maintained in equilibrium. Identify the impact of human industrial activity and the contribution of carbon dioxide to global warming. Distinguish between global warming and the “greenhouse effect”. (Unit 5&6)
- Distinguish between biofuels and fossil fuels. Compare renewable energy technology options.
- Describe the basic mechanism of nuclear fission reactors and problems associated with spent fuel. (Unit 7&9)
- Explain the chemistry of natural and polluted water. Identify how water quality is impacted by human activity. Explain how water is purified for human consumption. (Unit 10&11)

Course Materials

Textbook

It is strongly recommended that you acquire a copy of this textbook, which is available at the Western Bookstore.

Baird and Cann
Environmental Chemistry, 5th Edition
Freeman

Copies of the text and the solutions manual are available on 1-day reserve at the Taylor Library. The 4th Edition of the text is suitable for most of the course material, but please note that the chapters have been renumbered from the 4th to 5th edition, so care must be taken if you choose to use the 4th edition.

Calculator

You are welcome to use a non-programmable calculator during tests and exams. In order to be fair and consistent to all students, proctors cannot lend (or facilitate the lending of) calculators during tests or exams. It is your responsibility to bring an acceptable calculator and to ensure that it is in proper working order. The sharing or exchanging of calculators during tests or exams is not permitted.
Wi-Fi Enabled Device
A Wi-Fi enabled device can be used during class times to submit responses to critical thinking, analysis, and discussion questions. A smart phone, tablet, or laptop can be used for this purpose alongside Western’s Wi-Fi access (with your Western username and password). If you do not have a Wi-Fi enabled device, have no fear, and please read the “Critical Thinking in Class” section below for an alternative for you.

Course Evaluation
Your course grade, out of 100, will be calculated as listed below. *Your grade will automatically be reported using the weight version that gives you the higher final course grade. You must achieve a grade of 50% or greater to pass the course.

<table>
<thead>
<tr>
<th>Component</th>
<th>Date</th>
<th>Weight* (Version #1)</th>
<th>Weight (Version #2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry in the News Online Discussion</td>
<td>Throughout the term; Reflection due online Wednesday, November 13, 2019</td>
<td>14%</td>
<td>14%</td>
</tr>
<tr>
<td>Infographic Assignment</td>
<td>Hard copy due at beginning of class; Feedback component in class; Friday, November 29th, 2019</td>
<td>10%</td>
<td>10%</td>
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<tr>
<td>Critical Thinking in Class (iClickers)</td>
<td>Throughout the term</td>
<td>6%</td>
<td>0%</td>
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<tr>
<td>Test #1</td>
<td>Friday, October 4th, 2019</td>
<td>18%</td>
<td>18%</td>
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<tr>
<td>Test #2</td>
<td>Friday, November 1, 2019</td>
<td>18%</td>
<td>18%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>Scheduled by the Registrar</td>
<td>34%</td>
<td>40%</td>
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❖ Chemistry in the News Online Discussion
The purpose of this assignment is to have you discover and then analyze current environmental chemistry issues in the world around us by discussing current news articles with your peers. This assignment consists of:
- Posting about a current news article (detailed expectations on OWL)
- Replying to classmates’ posts throughout the discussion weeks (expectations determined as a class)
- Facilitating a discussion on your assigned forum during your designated week
- Synthesizing your discussion experience by responding to reflection questions

The Chemistry in the News discussion groups and designated weeks for posting and facilitating will be announced on Wednesday, September 11th, 2019. The discussion forums will open on Monday, September 16th and close Monday, November 11th, 2019. Once the discussion closes, you will compile your post, best reply, and responses to reflection questions regarding your experience facilitating a discussion and synthesizing your learning. This compiled Reflection is due on OWL (under Assignments) by Wednesday, November 13th, 2019. You are welcome to submit this reflection earlier, but late submissions will be deducted 10% per day unless academic consideration or accommodation is obtained. This Reflection will be graded, while the actual OWL forum will be referenced to confirm dates and posts, to determine your grade for this assessment.

A detailed description of this assessment will be available on OWL, along with a rubric for assessment. Note
that on your designated week for posting, you must share your post on the Monday or Tuesday of that week to allow your classmates to discuss your post for the remainder of the week. Late posts will receive a 10% deduction per day late. If exceptional circumstances arise that prevent you from making your Monday/Tuesday post, please email me.

❖ Infographic Assignment

The purpose of this assignment is to have you explore a Chem 2210 topic more deeply, and synthesize the key issues simply, demonstrating your understanding of a complex topic. Organizing and teaching someone else a topic allows you to learn the issues more deeply yourself. These infographics will also be a valuable review tool to share with your classmates as the course wraps up on Infographic Display Day. In pairs, you will select a topic covered in Chem 2210 and prepare an infographic summarizing key ideas and equations in a visually appealing way, accessible to a first-year science audience. Class time will be set aside for paired work on this project, but additional time outside of class may be required to complete this assignment. Instructions will be given in class on how to declare your preferred partner prior to the start of this assignment. Any students who prefer to be assigned to a partner will be appointed a partner on the day the assignment is introduced in class (Friday, November 15th).

This infographic will be evaluated for scientific accuracy, clarity of explanations and images, visual appeal, and accessibility to a first-year science student audience. A component of your grade for this project is also earned by providing feedback to your peers on Infographic Display Day. A detailed description of this assignment will be posted on OWL and discussed in class on Friday, November 15th. A rubric will be posted on the OWL course site for your reference. This assignment must be brought to class at 1:30 pm on Friday November 29th for the Infographic Display Day. Infographics submitted after this date will have an automatic deduction of 30% and will not be accepted after Wednesday, December 4th, unless academic consideration or accommodation is obtained. If you know you will be absent on November 29th for an important reason, please email me prior to November 29th to determine if alternate arrangements can be made.

❖ Critical Thinking in Class

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. Critical thinking, analysis, and discussion questions will be posed during class time, and responses will be collected using Western’s iClicker audience response system. The iClicker software, accessible through the OWL course page, 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 Wi-Fi-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 term. We will discuss how to set up this account during the first week of class. Please note that Western has Wi-Fi 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 in Class 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 each class. Please note – these paper forms will only be accepted immediately following the class in which the questions were asked. If you have any questions on how to meet these requirements, I am happy
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/consideration** for the occasional absence, as well as any technical difficulties you may encounter during the term. Thus, **additional consideration will not** be granted to make-up this grade. (That said, if extenuating circumstances arise that cause you to miss more than approximately two weeks of class in a row, please see your academic advisor for accommodation/consideration for this component and contact me). There will be many questions posed throughout the term, so you will have ample opportunity to demonstrate your analysis and critical thinking. At the conclusion of the course, the final 6% evaluation component will be calculated as follows:

| Percentage of Possible Points (%) | ≥80 | ≥75 | ≥70 | ≥60 | ≥50 | ≥40 | ≥30 | ≥20 | ≥10 | ≥0 | 0 |
|----------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|---|---|
| Grade Achieved (out of 6)        | 6.0 | 5.5 | 5.0 | 4.5 | 4.0 | 3.5 | 3.0 | 2.5 | 2.0 | 1.0 | 0 |

❖ **Test #1, #2, and Final Exam**
Both tests will be held during the normal class time and be 45 minutes in length. Room locations will be announced on OWL. If you miss Test #1 with academic consideration/accommodation for illness or personal reasons, the weight of this test (18%) will be added to Test #2 (+9%) and your final exam (+9%). If you miss Test #2 for illness or personal reasons and have formal consideration/accommodation, the weight will be added to the Final Exam. If you must miss a test for a scheduling conflict caused by Western University, a make-up or early-write test will be offered. Please note that regularly scheduled classes take precedence over midterm tests from other classes. The final exam is scheduled by the Registrar. Both tests and the exam are multiple choice.

- **Test #1** will cover all the material from the start of the term up to the Friday class before the test (approximately). The exact cut-off material will be announced in class and on OWL.
- **Test #2** will cover all the material since the first cut off (for Test #1) to the material covered on the Friday prior to the test (approximately). The exact cut-off material will be announced in class and on OWL.
- The **Final Exam** will be cumulative, but material covered on the first two tests will be assessed on the final exam through similar questions that appeared on the midterms.

**Code of Conduct for Class and Online Discussion**
To foster a supportive and enriching academic environment that is conducive to learning and free inquiry, Western has a Student Code of Conduct (http://www.uwo.ca/univsec/board/code.pdf).

As your instructor, I will promote this respectful and supportive learning environment both in class and online. In turn, I expect students in this course to also respect their fellow classmates and instructor, both during class times and through online discussions. Please be sure to phrase your ideas in a way that is respectful to all involved.

I will do my best to ensure I arrive on time, prepared and eager to teach – and I likewise expect you to arrive on time (as often as possible!) prepared, and ready to engage. I hope this course will be an excellent learning experience for you!
Policies

Electronic Device Policy
We will use electronic devices during class time for iClicker questions and for some research activities. You are also welcome to take notes on your device or by pen/paper during class time. That said, please only use your electronic devices for course-related activities during class time. All other uses of electronic devices are distracting to your learning, and to the learning of those around you, and you may be asked during the lecture to cease your distraction to others. If you need to take a phone call or engage in an off-task activity during class time, please step out of the classroom to complete your task and join us when you are ready to engage again.

Email Policy
Please ensure your emails are written in a professional format and tone. If you have questions about specific course topics/questions, please use the OWL forum so that all students can benefit from the discussion.

In accordance with policy, http://www.uwo.ca/its/identity/activatenonstudent.html, the centrally administered e-mail account provided to students will be considered the individual’s official university e-mail address. It is the responsibility of the account holder to ensure that e-mail received from the University at his/her official university address is attended to in a timely manner.

Tests and Exam Policy
Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following website: http://www.uwo.ca/univsec/handbook/appeals/scholoff.pdf. Computer-marked, multiple-choice tests and exams may be subject to submission for similarity review by software that will check for unusual coincidences in answer patterns that may indicate cheating.

For all tests and exams, it is the policy of the Department of Chemistry that any electronic devices, i.e., cell phones, tablets, cameras, or iPod are strictly prohibited. Only the specified calculator is permitted. All other devices MUST be left either at home or with the student’s bag/jacket at the front of the room and MUST NOT be at the test/exam desk or in the individual’s pocket. Any student found with one of these prohibited devices will receive a grade of zero on the test or exam. The Department of Chemistry is not responsible for stolen/lost or broken devices.

Academic Accommodation and Consideration
If you are unable to meet a course requirement due to illness or other serious circumstances, you must seek approval for the absence as soon as possible. Approval can be granted either through a self-reporting of absence or via the Dean’s Office/Academic Counselling unit of your Home Faculty. If you are a Science student, the Academic Counselling Office of the Faculty of Science is located in NCB 280, and can be contacted at scibmsac@uwo.ca. Their website is: http://www.uwo.ca/sci/undergrad/academic_counselling/index.html.

For further information, please consult the university’s policy on academic consideration for student absences:

If documentation is required to receive formal academic accommodation, students must deliver this documentation to the Dean’s Office/Academic Counselling unit of their Home Faculty (not to the instructor). Please visit the following link for policy on Accommodation for Illness:
A student requiring documentation for academic accommodation due to illness must use the Student Medical Certificate (https://studentservices.uwo.ca/secure/medical_document.pdf) when visiting an off-campus medical facility. For further information, please consult the university’s medical illness policy at: http://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_medical.pdf.

If you miss the Final Exam, contact your faculty’s Academic Counselling Office as soon as possible. They will assess your eligibility to write the Special (or makeup) Exam.

You may also be eligible to write the Special Exam if you are in a “Multiple Exam Situation” (see http://www.registrar.uwo.ca/examinations/exam_schedule.html).

**Equal Opportunity and Evaluation Policy**
The university is committed to academic integrity and has high ethical and moral standards. All students will be treated equally and evaluated using the criteria presented in this course outline and their respective weights. The evaluation criteria are based strictly on actual achievement, not on effort or how hard the student tried. Claims of an excellent academic history, of attendance in the course components, or of personal issues (family, relationship, financial, etc.) cannot be used to justify a higher grade in course because they are not criteria for evaluation.

There is no extra work available for extra credit or to “make up” another grade. No extra assignments, essays, experiments, or other work of any kind is offered to any student.

The requirement for a higher grade in order to, for example, maintain a scholarship, enter a program, or obtain a higher GPA for various reasons, is not a justifiable reason for increasing your grade. If we increased or “bumped” your grade (*i.e.* gave you a grade that you did not legitimately earn), it would be unfair to the other students and also a great disservice to the scholarships and programs who are evaluating all students on the basis of their grades.

Please contact your academic advisor if you require formal accommodation for missing a course component.

**Support Services**
Students are encouraged to make use of the free, study-skills courses and other services, including learning-skills counselling, provided by Learning Development and Success, learning.uwo.ca. Since this course includes multiple choice tests, I encourage you to take advantage of the free test-taking workshops offered to you!

The website for Registrarial Services is: http://www.registrar.uwo.ca.
The website for USC Services is: http://westernusc.ca/services/
Students who are in emotional/mental distress should refer to Mental Health@Western http://www.health.uwo.ca/mental_health/ for a complete list of options about how to obtain help.

**Crisis** contact information is available at: https://wjwww.uwo.ca/health/mental_welbeing/crisis.html

The policy on Accommodation for Students with Disabilities can be found here: www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_disabilities.pdf
The policy on **Accommodation for Religious Holidays** can be found here:
http://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_religious.pdf

Department of Chemistry on Social Media:
Webpage - [https://www.uwo.ca/chem/](https://www.uwo.ca/chem/)
Twitter - [https://twitter.com/westernuchem](https://twitter.com/westernuchem)
Facebook - [https://www.facebook.com/ChemistryatWestern](https://www.facebook.com/ChemistryatWestern)
Anticipated Course Topics (subject to revision*)

<table>
<thead>
<tr>
<th>Textbook Chapter</th>
<th>Title Description</th>
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<tbody>
<tr>
<td>Baird &amp; Cann</td>
<td>Stratospheric Chemistry: The Ozone Layer</td>
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<tr>
<td>Environmental Chemistry</td>
<td>The Ozone Holes</td>
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<tr>
<td>5th Edition</td>
<td>The Chemistry of Ground-Level Air Pollution</td>
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<td>The Environmental and Health Consequences of Polluted Air – Outdoors and Indoors</td>
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<td>The Greenhouse Effect</td>
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<td>Energy Use, Fossil Fuels, CO\textsubscript{2} Emissions and Global Climate Change</td>
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<tr>
<td></td>
<td>Biofuels and Other Alternative Fuels</td>
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<td></td>
<td>Renewable Energy Technologies: Hydroelectric, Wind, Solar, Geothermal, Marine Energy and Their Storage (if time permits)</td>
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<td>Radioactivity, Radon and Nuclear Energy</td>
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<td></td>
<td>The Chemistry of Natural Waters</td>
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<td>The Pollution and Purification of Water</td>
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*Although the topics listed above are the intended course topics, the instructor reserves the right to deviate from this list should an interesting topic of environmental concern appear in the news.

Anything that is covered in class or in an assigned reading is “testable”. If it is not covered in class, and it is not in any readings I may assign, it is not testable.

A detailed schedule for Chem 2210A is available on OWL.