Welcome to CHEM BIO 4GG9! The goal of this course is to introduce you to the rich research culture in McMaster University's Chemical Biology program. Here you will develop numerous laboratory skills while being exposed to cutting-edge innovative research. Good luck, work safely and have fun!

COURSE COORDINATOR
Dr. Jim McNulty
Office: ABB 262; ext 27393
Email: jmcnult@mcmaster.ca

EVALUATION BREAKDOWN

<table>
<thead>
<tr>
<th>Assessment Tool</th>
<th>% of Final Mark</th>
<th>Due Date</th>
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<tbody>
<tr>
<td>Initial Meeting form</td>
<td>0</td>
<td>Sept. 16th</td>
</tr>
<tr>
<td>Project Outline</td>
<td>2</td>
<td>Oct. 25th</td>
</tr>
<tr>
<td>Interim Report</td>
<td>8</td>
<td>Dec. 7th 4:00 pm</td>
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<tr>
<td>Colloquium Day Presentation</td>
<td>15</td>
<td>To Be Determined</td>
</tr>
<tr>
<td>Thesis</td>
<td>25</td>
<td>Apr. 6th 4:00pm</td>
</tr>
<tr>
<td>Laboratory Work</td>
<td>50</td>
<td>End of Term</td>
</tr>
<tr>
<td>Overall mark</td>
<td>100</td>
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One copy of the initial meeting form, project outline and interim report are to be submitted hard-copy to Linda Spruce in the main office (ABB 156) prior to the due date. A second copy of each document must also be submitted directly to your thesis supervisor by 4:00 pm of the due date (your supervisor may prefer an electronic to hard copy). Two copies of your final Thesis are to be submitted by 4:00 pm of the due date to Linda. A copy of your thesis is also to be submitted to your supervisor by 4:00 pm of the due date. Late work will be subject to a 20% per day penalty, and will not be accepted after three days.

DISCLAIMERS
The coordinator and university reserve the right to modify elements of the course during the term. The university may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes. It is the responsibility of the student to check their McMaster email and course websites weekly during the term and to note any changes.

COPYRIGHT POLICY: In this course you will have access to material that is subject to copyright laws. You are not allowed under any circumstances to share or redistribute this material in any printed or electronic form without explicit written consent of the copyright holder. This includes posting any course material on Internet bulletin boards, course repositories, social networks, etc.

A web-based service (turnitin.com) may be used to protect against plagiarism. University policy dictates that the use of turnitin.com cannot be made mandatory. If you object to your work being checked with turnitin.com, please speak to the course coordinator as soon as possible. All work will be screened for plagiarism even if turnitin.com is not used.

Avenue to learn (avenue.mcmaster.ca) will be used for posting course information. Students should be aware that when they access the electronic components of this course private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in this course will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure please discuss this with the course coordinator.
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IMPORTANT DATES & INFORMATION

Initial Meeting (First week of class)
Due Date: Friday September 16th, 2016
- Students are required to meet with their supervisor to discuss the research project, course requirements, work schedule and expectations of the supervisor. The student and supervisor must agree on all these terms and then fill out the “Initial Meeting” form, which summarizes the main outcomes of the meeting. Please print and complete this form, page 7 of this document.
- The form is to be submitted to Linda Spruce in the main office (ABB 156) by 4:00 pm of the due date. Laboratory work should begin following this meeting.
- PLEASE NOTE: students who worked in the same laboratory in the preceding summer will also be required to submit a one page description of their summer research.

Project Outline (2%)
Due Date: October 25th, 2016
- Students are required to provide a condensed introduction/review of their research field with particular emphasis on their thesis project. This should include a statement of the proposed research and its possible impact on the field as a whole.
- The outline should be no more than 2 pages double-spaced, Times New Roman 12 point font, and 2 cm borders on each side. References do not count in the page limit. The outline should include at least 1 figure (not included in the 2 page limit) that best depicts the project you are working on. You should aim to create the figure(s) yourself or in cases where this is not technically possible, adapt an existing figure, and use it/them to highlight the relationship of your project to the field as a whole. References should be formatted in the ACS Chemical Biology style. AT LEAST 10 references are expected of which a maximum of three can be review articles. No books/websites are allowed as references.
- Your thesis supervisor will mark your project outline based on the following criteria:
  o (/35) Quality of background material
  o (/15) Clear statement of the problem
  o (/15) Figure(s)
  o (/15) References
  o (/20) Clarity and style of the document

Interim Report (8%)
Due Date: December 7th, 2016
- Students are required to provide a concise description of their research project, their progress to-date and their future goals.
- The purpose of this exercise is to ensure that you and your project are on the right track, and to address any problems with the experiments.
- The report should be no more than 4 pages double-spaced, Times New Roman 12 point font, and 2 cm borders on each side. Figures, tables, and references do not count in the 4 page limit and can be added at the end of the document. The use of subheadings to section your report is strongly recommended.
- References should be formatted in the ACS Chemical Biology style.
- Your thesis supervisor will mark your interim report based on the following criteria:
  o (/20) Understanding of the project
Results obtained and their interpretation/analysis (preliminary results at this time are acceptable). In cases where significant problems were encountered, how were they resolved or how was the quality of the troubleshooting efforts.

Discussion of future goals and/or alternative experiments if the ones proposed do not work as anticipated

Clarity and style of the document

Colloquium Presentation (15%)
Mid to Late March (~4:30 pm – 10:00 pm) /Abstract is due one week before the presentation

- Students will present their research in a 15+5 minute seminar (15 minute seminar followed by a 5 minute question and answer period).
- **Abstract:** Students will be required to submit an abstract electronically to (jmcnult@mcmaster.ca) by 4:00 pm one week before the colloquium presentation. Please format your abstract as indicated below and submit it as a word document (.doc or .docx). Failure to adhere to the formatting guidelines will result in a 2% reduction from your presentation mark. Late abstracts will be subject to a 2% per day reduction from your presentation mark.
  - Title (bold)
  - Author names (written in full) - write your name first (bolded and underlined), followed by any contributing authors and the name of your supervisor
  - Text (maximum 200 words)
  - Formatting: single-spaced, Times New Roman 10 point font, justified margins
- The presentation will be evaluated by attending faculty and a grade will be assigned.
- Please read the “Colloquium Guidelines” for details.

Thesis (25%)
April 6th, 2017 (last day of classes)

- The written thesis is the capstone of the CHEM BIO 4GG9 course.
- Please read the “Thesis Guidelines” for details.

Laboratory Work (50%)

- You should plan to have completed most of your experimental work by early to mid-March, so that you can spend sufficient time interpreting your data, preparing your presentation, and writing your thesis.
- At the end of the term your supervisor will fill out and submit a “Laboratory Performance Evaluation” form to the course coordinator.
- Students will be evaluated on the following criteria:
  1. Laboratory Work
     - Ability to plan and execute experiments in an efficient and organized manner
     - Skill in laboratory techniques
     - Ability to interpret data; not to overlook any conclusions nor to draw unfounded conclusions
  2. Responsibility and commitment to project
     - Demonstration of originality and independence of thought
  3. Understanding of the research problem and how it fits in with existing knowledge and future studies
- Supervisors are requested to provide justification for the grade assigned with specific comments and examples.
DOING WELL IN THE COURSE
You do not have to have enough results for a scientific publication to write a good thesis and obtain a good mark in CHEM BIO 4GG9.

In the reports, thesis, and colloquium, your goals are to show that you understand the science behind your project, and to present your work in a clear, and concise fashion. Your supervisor as well as other lab members are good resources and may be able to offer you suggestions as to how to write your thesis and how to deliver an effective presentation. Ask for their help and suggest a test run of your presentation a week before the Colloquium day.

In the laboratory work component of the course, your goals are to develop and demonstrate your abilities to plan, conduct, and troubleshoot experiments, and to critically analyze and interpret your data. Experimental work requires a significant time commitment; your work ethic will be a significant factor in your success in the course. **You should expect to spend 18 hours per week in the laboratory.** Again, your supervisor and lab-mates will help guide you through the process.

You will learn that an element of uncertainty is inherent in all research. Some projects will work out as anticipated, while others will not; this is the nature of research. The purpose of the course is to provide you with experience in original research, and in presenting the results of the work in a coherent and intelligent manner. The best approach to doing research is to stay positive and focused at all times!

Your final grade will be more dependent on the scientific skills you demonstrate, rather than on the specific outcome of your research. You may expect a good grade in the course if you demonstrate competence and diligence in the laboratory, a good grasp of the scientific problem and the significance of your results, and if you prepare a well written thesis.

LAB NOTEBOOK GUIDELINES
A notebook is an essential tool to help organize your laboratory research. Number each page of the notebook, date and record each experiment, including the experimental procedure, results and analysis with calculations. The content of the notebook should be easily readable and should contain enough information so that another undergraduate student could repeat the experiment with no prior knowledge. Care should be taken to ensure the notebook is well organized and contains an index for ease of navigation. Make sure to include all details of day-to-day experiments including a purpose for the experiment, any mistakes made throughout the experiment and the conclusions. Include all discussions and thoughts on the experimental goals (this includes email communications between your supervisor/collaborator(s)). This notebook is an integral part of your supervisor’s research and must be left with the supervisor at the conclusion of the project.

COMPLETION OF LAB WORK
Students should aim to have their laboratory experiments completed by early to mid-March to allow sufficient time for data analysis, preparing your presentation and writing a thesis.

SAFETY TRAINING
Please ensure that you have taken the core/update WHMIS, Fire Training, Biosafety Training (if applicable) and all other relevant safety courses (see attached form) prior to starting in the lab. Your supervisor will inform you of additional, lab-specific required training.
ACADEMIC DISHONESTY
The Academic Integrity Policy (http://www.mcmaster.ca/policy/Students-AcademicStudies/AcademicIntegrity.pdf) states that students are responsible for being aware of and demonstrating behaviour that is honest and ethical in their academic work. Breaching of academic ethics is ultimately destructive to the values of the University; it is, furthermore, unfair and discouraging to those students who pursue their studies with integrity. Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. It can result in serious consequences such as a grade of zero, loss of credit or even expulsion from the university.

SUGGESTED BOOK
  • This book is currently available as a McMaster library electronic resource.
CHEM BIO 4GG9
INITIAL MEETING FORM

• Supervisors: please take the time with your student to summarize the outcome of the following discussion topics.
• Students: please print this page and bring it with you to the initial meeting. Completed forms are to be submitted to Linda Spruce by 4:00 pm of the due date.

RESEARCH PROJECT (briefly summarize the main goal(s) of the project)

COURSE REQUIREMENTS (clearly write out all the CB 4GG9 course components (e.g., project outline, interim report) and lab specific requirements (e.g., training requirements, attendance at weekly lab meetings, lab chores, etc.) that need to be achieved by the student)

WORK SCHEDULE (a statement showing that the student understands the main concept of the research project and feels confident that the time allotted is sufficient to achieve the goal; please also include a project timeline)

PLEASE ATTACH A ONE PAGE SUMMARY OF SUMMER RESEARCH, IF APPLICABLE.

Student Name __________________________ Supervisor Name ______________________

Student Signature __________________________ Supervisor Signature ______________________

We may post your thesis and/or your presentation (PDF format) on Avenue as a resource for future CB 4GG9 students. By signing this form you grant us permission to do so.

Student signature: _________________________

If you object to having your work posted on Avenue please do not sign this form. Students can revoke this signature on this form at their request prior to the completion of the course. They must contact the course coordinator in writing to do so.
COLLOQUIUM (15%) – Mid/Late March

Students and supervisors will be notified of the exact time and location of the presentations in late February/early March. NOTE: IF YOU MISS YOUR PRESENTATION TIME YOU WILL RECEIVE AN AUTOMATIC ZERO ON THE PRESENTATION.

The goal of the research presentation is to summarize your research project. Your focus should be on presenting the data generated and describing how your results fit in with your research plan and the field as a whole.

Your presentation should emphasize the:
- Objectives of the project
- Background information necessary to understand its relevance and importance
- Methods adopted
- Research work accomplished (if you were working on a collaborative project, be sure to clearly distinguish between your contributions and your collaborators)

The presentation will be early enough for any comments or questions raised to be considered in the written thesis.

Presentations are to be made using PowerPoint. A laptop computer and projector will be available for your presentation. Due to time constraints, students will not be able to use their personal laptop. If you plan to use movies or Flash-animation in your presentation, contact the course coordinator to arrange to test the movies on the presentation-laptop at least two days before your presentation.

An assignment dropbox will be setup on Avenue. Students are required to submit their PowerPoint presentation as well as a PDF copy of their presentation to Avenue before 8 am on the day of colloquium. Please name your files as follows: “Full name_CB 4GG9_Year”. Late penalty: 5%/hour. The presentations will be loaded to a laptop that will be used for all presentations. Each presentation will last 15 minutes with 5 minutes of questions and discussion. Any work done during the summer months or prior to the beginning of the project should not be included in the presentation without being clearly identified and acknowledged.

Please note: the PDF copy of your presentation may be made available for future students to view if consent was given.

The course coordinator, 4GG9 supervisors, interested faculty and students will be in attendance. Each student will be evaluated by all faculty members present. Students will be evaluated based on their:
- Understanding of the background and context of their project
- Clarity of the presentation
- Ability to answer questions
- Knowledge of the experimental approach
- Critical evaluation of their data and project

Attending faculty will be asked to fill out an evaluation form to the course coordinator at the conclusion of the oral presentations. Marking scheme: 4.0 Excellent; 3.0 Good; 2.0 Satisfactory; 1.0 Unsatisfactory.
CHEM BIO 4GG9
THESIS GUIDELINES

THESIS OVERVIEW
The thesis can be no longer than 20 pages, double-spaced, Times New Roman 12 point font, and 2 cm margins on each side. All pages must be numbered (bottom, right). Figures, tables, and references do not count in the 20 page limit and can be added at the end of the document. You will need to express your ideas and results concisely, to stay within the page limit. Marks will be deducted for exceeding the page limit and for not following the format guidelines.

Please follow either the ACS Chemical Biology or the Journal of Organic Chemistry formatting guidelines. *Exception: the results and discussion sections are to be kept separate.

The thesis is due on April 8th, no later than 4:00 pm. Two copies are to be submitted to Linda Spruce, one copy to your supervisor and one copy (PDF format) is to be submitted electronically to Avenue. Please name your files as follows: “Full name_CB 4GG9_Year”.

Please note: the PDF copy of your thesis may be made available for future students to view if consent was given.

THESIS OUTLINE
Title, authors (your name, followed by your supervisor’s) and name of institution
• The title should be succinct (no more than 2 printed lines)
• Below the authors include a statement of acknowledgement, briefly describing the contribution of all contributing members, if applicable

Abstract
• A clear and concise summary of your main finding(s) and their significance. Should not exceed 300 words.

Introduction
• A brief review of the relevant literature and a statement of the purpose of the work. The introduction should clearly place your findings in the context of the field as a whole. This section should not be used as a long summary of the field.

Results
• This section should describe the data presented in your tables and figures, which must be properly titled and captioned. Care must be taken not to over-analyze or discuss the data in this section.
• Tables
  o Should contain a title and a short description of the table.
• Figures/Figure Captions
  o Should have titles and figure legends describing the experiment in sufficient detail to allow readers to understand the figure in the absence of additional text.
  o Adjustments of brightness, contrast, or color balance are acceptable if they are applied to the whole image and as long as they do not obscure, eliminate, or misrepresent any information present in the original, including backgrounds.
- **Numerical data.** Error bars on graphic representations of numerical data must be clearly described in the figure legend. The number of independent data points (N) represented in a graph must be indicated in the legend. Numerical axes on graphs should go to zero, except for log axes.

**Discussion**

- This section is designed entirely for interpreting the data. You can include future experiments that need to be done, other controls that should be performed and even your opinion on what the data might mean to the field as a whole. You can use figures to make your points clear. Care should be taken not to over-interpret your data. Try to rationalize unexpected results and suggest improvements, which may allow the original goals of the proposal to be better realized. Your ideas should be presented in a clear, thought-out manner.

**Methods / Experimental Section**

- Detailed descriptions of the experiments done, written in a way that someone else could repeat them and continue the work. The experiments must be clearly laid out and must spell out all buffers used (including concentrations), all equipment used, chemicals, solvent systems, NMR settings, etc. If a procedure has already been published in a journal article in sufficient detail, then a reference will suffice. Otherwise, if the procedure has been modified, the alterations to the procedure should be clearly outlined.

**References**

- Should be cited throughout the text by a superscript number and numbered in order of their citation in the text, figures and tables. The references should follow the appropriate ACS style.

**WRITING STYLES**

The following is a compilation of excerpts obtained from the following website: [http://grcpublishing.grc.nasa.gov/editing/chp2.CFM](http://grcpublishing.grc.nasa.gov/editing/chp2.CFM)

- Please visit the website for more details.

Before you start writing your thesis print out all your relevant data figures and tables and take a moment to arrange them in the order you feel conveys the most logical story. This story should be clear and concise with a set objective that is laid out in a continuous manner – this will probably not be the order in which you performed the experiments. Below is an excerpt from the website mentioned above that describes the meaning of clarity, conciseness, continuity and objectivity:

**Clarity**

*The purpose of a technical report is to transmit conclusions and their supporting evidence. To do this, your report must convey your exact meaning to the reader. The text must be clear and unambiguous, mathematical symbols must be fully defined, and the figures and tables must be easily understood. Clarity must be met from the readers’ point of view. What may be clear to you as the author may not be clear to your readers. Remember, you are intimately familiar with the work, but they are not. You must continually reexamine your rough drafts with a reader’s critical eye. Readers will not tolerate confusion. They must never become uncertain about what you are discussing, why you are discussing it, or what your plan of presentation is. They will rebel if forced into these mental gymnastics. If there is any discontinuity without proper explanation, the average reader will lay aside the report for later reading. Once this happens, the chances are slight that it will ever be read. You usually have just one chance to sell the reader on the report’s objectives. And that requires a presentation that is logical, simple, and systematic.*
Conciseness
Most of your intended readers are busy. Therefore your reports should be concisely written. That is, your story should be told with the fewest possible words and illustrations. Help your readers by omitting everything irrelevant to the results and conclusions. Do not be disappointed if a report that describes a lengthy program is only a few pages long: Report quality is often inversely related to report length. Your readers will be interested in your conclusions and the supporting evidence and will want to get these as quickly as possible. They will not be particularly interested in any problems you had in getting the results. Explaining such problems usually just hides the important aspects of the report. On the other hand, do not condense reports at the expense of your readers' understanding. Give enough information to enable them to understand clearly what you are describing and why you are describing it. Include enough background information to make the context clear. Do not assume that they will remember details of a previous report—or have even read it. Include all details needed to understand the current report. In short, make your reports brief but comprehensible.

Continuity
Reports should tell a complete story as logically and interestingly as possible. This requires continuity between succeeding sentences, paragraphs, and sections and between the written text and the figures and tables. Transitional words, phrases, sentences, or even paragraphs may be needed to lead your readers through the story. But overusing transitions can slow the pace of your narrative. Carefully choose the places at which you refer to figures and tables to limit distraction. Making these references at the beginning or end of a discussion is usually preferable.

Objectivity
Technical reports should be objective and show restraint. Be honest with your readers. They will become suspicious if they detect hidden meanings or any type of subterfuge, and you will then have little chance of convincing them of your conclusions. They expect you to evaluate the data honestly. Do not try to hide deficiencies in your research. No technical report is better than the research on which it is based. Tell your readers frankly what your assumptions were, what your probable errors are, and what you may not understand about the results. In addition to being honest, be tactful. If you are faced with the problem of presenting technical results that may conflict with previous results or with the personal prejudices of some readers, refrain from making dogmatic statements and avoid sounding egotistical. Your readers will be persuaded by facts, but they may become irritated if you attempt to impress them with your cleverness or to claim credit for accomplishments. Write to express, not to impress.

Additional information on writing styles can be found at the following website:
http://abacus.bates.edu/~ganderso/biology/resources/writing/HTWtoc.html

THESIS EVALUATION

The thesis mark will be the average of a mark determined by two full time or emeritus faculty members who are also supervising a Chemical Biology thesis student and who have been assigned to read your thesis. Your research supervisor will not mark your thesis. If possible, the graded thesis will be returned to the student. The mark breakdown will be:

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<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Abstract</td>
<td>5%</td>
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<tr>
<td>Introduction</td>
<td>15%</td>
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<tr>
<td>Results</td>
<td>20%</td>
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<tr>
<td>Discussion</td>
<td>25%</td>
</tr>
<tr>
<td>Methods / Experimental Section</td>
<td>15%</td>
</tr>
<tr>
<td>Overall Organization &amp; Clarity</td>
<td>20%</td>
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CHEM BIO 4GG9
THESIS EVALUATION

The thesis should be evaluated based on the following criteria:
- Understanding of the problem and relevant background information.
- Results obtained and their interpretation/analysis.
- In cases where significant problems were encountered, how were they approached and resolved.
- Clarity of document based on the thesis guidelines provided (e.g., formatting, citation)

Student Name

Student Name

Faculty Evaluator Name

The thesis is worth 100 marks (25% of the final grade).
- Please assign a mark for each category below, giving appropriate justification. This information may be consolidated and made available to the student upon request.
- Please write legible comments for the student directly on their thesis. Marked and returned theses will be handed back to the students.

<table>
<thead>
<tr>
<th>SECTION</th>
<th>MARK</th>
<th>COMMENTS/JUSTIFICATION</th>
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<tbody>
<tr>
<td>Abstract (5)</td>
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<td>Introduction (15)</td>
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<td>Discussion (25)</td>
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<td>Methods / Experimental (15)</td>
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<td>Organization &amp; Clarity (20)</td>
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<tr>
<td>TOTAL (100)</td>
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Comments for the course coordinator, if applicable:
CHEM BIO 4GG9
LABORATORY PERFORMANCE EVALUATION

Student Name
Supervisor Name

Laboratory performance is worth 100 marks (50% of the final grade).
- Please assign a letter grade (A⁺ to F) for each category below. This information may be made available to the student upon request.
- Please assign an overall mark out of 100, giving appropriate justification.

<table>
<thead>
<tr>
<th>LETTER GRADE</th>
<th>COMMENTS</th>
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<tr>
<td>Understanding of the problem</td>
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<td>Familiarity with relevant literature</td>
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<td>Initiative</td>
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<td>Work habits</td>
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<tr>
<td>Ability at research</td>
<td></td>
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<tr>
<td>Work completed and its significance</td>
<td></td>
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<tr>
<td>Data analysis interpretation</td>
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<tr>
<td>Industriousness</td>
<td></td>
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<tr>
<td>Experimental judgment</td>
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</table>

OVERALL ABILITY (100) ________________

JUSTIFICATION FOR THE ASSIGNED MARK:
Upon completing your research work in your supervisor’s group, the Chemistry and Chemical Biology Department requires that you complete the “Department of Chemistry and Chemical Biology Sign-Out Sheet” and obtain the appropriate signatures.

Please note the "Research Checklist" contained in this form and comply with it literally. All data in the form of spectra, computer files, diagrams, etc., need to be organized, clearly labelled and presented to your supervisor prior to your departure. This includes the original copy of your laboratory notebook(s) and all related research samples and materials. While you hold the copyright to your written thesis, these items are the property of your supervisor.

The completed sign-out form is to be submitted to Linda Spruce (ABB 156) no later than 4:00 pm on April 8th 2016.

The check-out procedure is required as part of your 4GG9 project. It reflects common practice in universities, research institutes and industry. Failure to comply will result in a reduction in your final grade. The penalty assessed in these respects will be arrived at in consultation with your thesis supervisor.