Course Coordinator:
Dr. Michelle MacDonald (macdonml@mcmaster.ca), ext. 22316, HSC 4H45

Course Administrator:
Mizan Graham (mgraham@mcmaster.ca), ext. 22059, HSC 4H45

Course Guidelines

The department of Biochemistry and Biomedical Sciences considers research to be a vital component of an undergraduate education in Biochemistry. Biochemistry 3A03 offers students the opportunity to gain valuable research experience and provides excellent preparation for a future in industry or graduate school. The course is a twelve week research project that can be undertaken in a laboratory during the fall, winter or summer term. Students are responsible for arranging a suitable project, location and agreement of a supervisor. To obtain permission of the department to take this course, students must complete and submit the required permission form and one-page research proposal to Mizan Graham in HSC 4H45.

The following information will help in the selection of an appropriate research project and potential supervisor.

Course Basics
This research course will require at least as much time as a regular course for which you receive 3 units of credit and differs from a regular course in terms of the more independent nature of the work, and the degree of student responsibility and initiative. Assessment in this course is based on laboratory work (approximately 12 hours per week in one term) and a final written report.

Course Registration
Students may register for this course during the summer, fall or winter term, and pending permission of the department, may complete the course requirements during the summer term. Should students complete the course during the summer months, the 12 week/144 hour work requirement may be condensed into a 4 week period of full-time work with the agreement of the supervisor. Students may not receive remuneration for the coursework, but may be compensated for any time that the supervisor wishes to employ the student beyond completion of the course requirements.

Making Arrangements for a Research Supervisor and Project
Students are responsible for making arrangements with a suitable supervisor and research project. The work may be undertaken in a research laboratory here at McMaster or at any institution, provided that the supervisor’s research is in a field related to Biochemistry, Biomedical Sciences, Molecular Biology or Genetic Engineering. For a full listing of members and associate members in the Department of Biochemistry and Biomedical Sciences, please refer to http://www.fhs.mcmaster.ca/biochem/people/faculty/index.php.

The supervisor should be provided with this information/evaluation package and agree to supervise the student for the full term, and submit an evaluation at the end of the term, based on laboratory performance and a final written report.

Acknowledgement of Previous Work Related to the Project
Students who may have previously worked in the same laboratory in which they are completing the requirements for Biochemistry 3A03 are asked to provide a one-page summary of any work that is related to the project being undertaken for Biochemistry 3A03. This summary should be submitted with the research proposal. Any work completed prior to the student’s registration in Biochemistry 3A03 should not be included as part of the student’s evaluation or final report without clearly identifying and acknowledging it.

**Laboratory Performance**

To ensure the greatest success with their project, students will be expected to spend an adequate number of hours in the laboratory each week (approximately 12 hours per week). Problem-solving, creativity, innovation and good experimental technique are the qualities of a good scientist. Students are encouraged to explore alternative interpretations of data or to suggest what line of investigation should be next.

Safety in any laboratory setting is first and foremost. Before performing any protocol, students should be familiar with the materials, reagents and possible hazards involved in the experiment. Students are reminded to consult the Material Safety Data Sheets (MSDS) for each reagent that they use.

**Safety Training and Liability Issues**

Appropriate safety training (i.e. WHMIS, Radiation Safety) must be completed prior to beginning laboratory work. It is the responsibility of the supervisor to ensure that students have received the required safety training. Should you complete your course requirements outside of McMaster University, you must also complete the required Risk Management forms, available in HSC 4H45.

**The Final Report**

The final report must be submitted directly to the supervisor for evaluation before the last day of class in the term. An electronic copy of the report must also be submitted to Mizan Graham at mngraham@mcmaster.ca. The report should follow the format of a standard biochemical journal, eg. Journal of Biological Chemistry.

Your report should contain the following sections:

1. **Title Page:**
   - Title of project
   - Student name and number
   - Supervisor name, department and institution
   - Course name
   - Term in which the project was carried out
   - Date submitted

2. **Table of Contents:**
   - With page numbers

3. **List of Abbreviations:**
   - Abbreviate only words or terms used more than 3 times. It is not necessary to include standard abbreviations for time, mass, DNA, RNA, etc…

4. **Abstract:**
   - A one-page concise summary of the questions asked, results and significance.

5. **Introduction:**
A summary of the current state of knowledge in the area of study, a statement of the problem and the approach used to address it (3-4 pages in length).

6. **Experimental Procedures:**
   This section should contain sufficient details of the experimental protocols for someone else to repeat the experiment. If the procedure has already been published in a journal article in detail, a reference will suffice. However, if a published procedure was modified, the alterations to the original protocol should be clearly outlined. Describe in detail any new techniques developed during the project.

7. **Results:**
   Summarize the data obtained from your experiments in figures and/or tables, as appropriate, following the journal format for table headings and figure legends. Figures and tables should be clearly labeled and easy to interpret. Proper statistical analysis is required in most cases or at least some statement about reproducibility. Include both positive and negative results, making brief mention of failed experiments.

8. **Discussion:**
   This section is where you interpret the results of your experiment. Be cautious not to simply restate the results, but to analyze the meaning of these results in the context of the problem you posed in your introduction. Explain the significance of your results and what the impact of these is on the field of study. If appropriate, use figures, diagrams and models to illustrate your point. Attempt to explain any possible causes for failures or negative results. Also include suggestions for future work.

9. **References:**
   Any standard style of referencing is acceptable. Accuracy in your referencing is important, and be sure to find the most current papers on a subject.

   The following are some additional general guidelines for the preparation of the report:
   - 20-30 pages in length
   - double-spaced throughout
   - 12 point font
   - 2.5 cm side margins
   - 3 cm top and bottom margins
   - all pages numbered consecutively, including title page, references, tables and figures
   - stapled in the top left-hand corner

**Academic Integrity:** You are expected to exhibit honesty and use ethical behavior in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic 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. This behaviour can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: “Grade of F assigned for academic dishonesty”), and/or suspension or expulsion from the university.

It is your responsibility to understand what constitutes academic dishonesty. For information on the various types of academic dishonesty please refer to the [Academic Integrity Policy](http://www.mcmaster.ca/academicintegrity) located at [http://www.mcmaster.ca/academicintegrity](http://www.mcmaster.ca/academicintegrity).

The following illustrates only three forms of academic dishonesty:
1. Plagiarism, e.g. the submission of work that is not one’s own or for which other credit has been obtained.
2. Improper collaboration in group work.
3. Copying or using unauthorized aids in tests and examinations.

Note: The instructor 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.

Please retain this information for future reference.
Course Requirements and Timetable for Biochemistry 3A03

 QUESTING DEPARTMENTAL PERMISSION

The student should arrange a meeting with his/her supervisor to discuss the research project, course requirements, work schedule, and the expectations of the supervisor. Having made arrangements with a supervisor, students must complete and submit the required permission form with one-page research proposal and the supervisor/student agreement form to Mizan Graham in HSC 4H45 to allow sufficient time for departmental approval before registering for the course.

ACKNOWLEDGEMENT OF PREVIOUS WORK

If the student has previously worked in the same laboratory, a one page summary of prior work that is related to the project being undertaken must be submitted with the permission form.

SAFETY TRAINING AND RISK MANAGEMENT FORMS

Appropriate safety training must be completed prior to beginning laboratory work. Should you complete your course requirements outside of McMaster University, you must also complete the required Risk Management forms and submit these to HSC 4H45 before beginning the project. Please see the course coordinator regarding this important issue.

SUBMISSION OF FINAL REPORT

The final report is due by the last day of class in the term. A hard copy should be submitted directly to your supervisor for evaluation, and an electronic copy to Mizan Graham in the Department of Biochemistry and Biomedical Sciences at mgraham@mcmaster.ca. Late submissions will be penalized with a 10% overall mark reduction per day.

FINAL PROJECT EVALUATION

The supervisor will fill out and submit the final ‘Project Evaluation’ form in a sealed and signed envelope to the student. The final grade will be based upon the evaluation of a combination of the student’s lab work (experiment, result, interpretation) and final report, and will count for 100% of the final mark.

Supervisors will evaluate their students based on:
1. Understanding of the problem
2. Familiarity with the relevant literature
3. Initiative
4. Work habits
5. Ability at research
6. Data analysis interpretation
7. Industriousness
8. Experimental judgment
9. Written skills
10. Quality of the final report

The supervisor is asked to submit the evaluation form to the course administrator in HSC 4H45 before the date designated on the supervisor/student agreement form. The student may also request a copy of the evaluation from the supervisor.
Project Evaluation
for Biochemistry 3A03

Please return this evaluation to Mizan Graham in the Department of Biochemistry and Biomedical Sciences in HSC 4H45, via email (mgraham@mcmaster.ca) or mail to the above address before ________________.

Student Name: __________________________________________

Supervisor Signature: ______________________________________

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Overall evaluation (numerical score out of 100):

COMMENTS (please use other side or attach additional sheet if required):