Biochemistry 2B03 (2017/18)

Nucleic Acid Structure and Function

Note: 1) 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.

2) You are expected to exhibit honesty and use ethical behaviour 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, located at 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.

3) In this course we will be using a web-based service (Turnitin.com) to reveal plagiarism. Students will be expected to submit their work electronically to Turnitin.com and in hard copy so that it can be checked for academic dishonesty. Students who do not wish to submit their work to Turnitin.com must still submit a copy to the instructor. No penalty will be assigned to a student who does not submit work to Turnitin.com. All submitted work is subject to normal verification that standards of academic integrity have been upheld (e.g., on-line search, etc.). To see the Turnitin.com Policy, please go to www.mcmaster.ca/academicintegrity.

4) In this course we will use Avenue to Learn. 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 instructor.

5) If you are absent from the university for a minor medical reason, lasting fewer than 5
days, you may report your absence, once per term, without documentation, using the McMaster Student Absence Form. Absences for a longer duration or for other reasons must be reported to your Faculty/Program office, with documentation, and relief from term work may not necessarily be granted. When using the MSAF, report your absence to singhk2@mcmaster.ca. You must then contact Dr. Karun Singh immediately (normally within 2 working days) by email to learn what relief may be granted for the work you have missed, and relevant details such as revised deadlines, or time and location of a make-up exam. Please note that the MSAF may not be used for term work worth 30% or more, nor can it be used for the final examination.

**Instructors:**
Dr. Karun Singh  
Please contact by email to singhk2@mcmaster.ca

Dr. Kristin Hope  
Please contact by email to kristin@mcmaster.ca

**TAs:**  
Vickie Kwan, kwany2@mcmaster.ca, Paper 1 inquiry  
Brianna Unda, undabk@mcmaster.ca, Paper 1 inquiry  
Nadeem Murtaza, murtazn@mcmaster.ca, Paper 2 inquiry  
Jalees Nasir (nasirja@mcmaster.ca), Paper 2 inquiry  
Laura De Rooij, derooij@mcmaster.ca, A2L, logistics, marking tests and exam

**Lectures:**  
Monday, Wednesday 8:30-9:20 AM  
Friday 10:30-11:20 AM

**Location:** TSH_120

**Office Hours:** This will be announced in class. The purpose of office hours is to provide an allotted time slot for students to ask questions to the TAs regarding lecture materials.

**Course Textbook:**  
Biochemistry, Garrett & Grisham, Canadian Edition (required)

**Course objectives:**  
Nucleic acids store and transmit genetic information in all cells. An accurate and detailed knowledge of their structure and function is vital for molecular scientists. Equally importantly, nucleic acids research have been a rich source of discovery and invention that is drastically enhancing our understanding of cells and diseases. In this course, we will examine the structure of nucleic acids, genes, the manner in which DNA is replicated and how its information is used by cells. In addition to conveying the prevailing paradigms in this field, we will discuss how nucleic acids are studied experimentally and how we know what we know about them today. Finally, students will be given
opportunities, through examination of the primary research literature, to learn how our human creativity and imagination has led to numerous important scientific findings in nucleic acids research.

**Evaluation:**

**Test 1: 25%**  
Wednesday, Oct. 4, 2017, in class. This test will be on the materials covered in Classes 2-11.

**Test 2: 25%**  
Monday, Nov. 20, 2017, in class. This test will be on the materials covered in Classes 18-26.

**Group Project: 15%**  
2.5% will be on attendance and participation (marked by your TA), 12.5% on your answers to the questions.

**Final Exam: 35%**  
The final will cover all lecture content by Drs. Singh and Hope. It will **NOT** include the papers covered in the written assignment.

**Detailed schedule:**

**Classes 1-17 by Dr. Singh.**

**Class 1,** Wednesday, Sept. 6, 2017  
Opening class and general outline

**Class 2,** Friday, Sept. 8, 2017  
Nucleotides and nucleic acids 1. Ch 24-25

**Class 3,** Monday, Sept. 11, 2017  
Nucleotides and nucleic acids 2. Ch 24-25

**Class 4,** Wednesday, Sept. 13, 2017  
Nucleotides and nucleic acids 3. Ch 24-25

**Class 5,** Friday, Sept. 15, 2017  
DNA replication, recombination and repair 1. Ch 27

**Class 6,** Monday, Sept. 18, 2017  
DNA replication, recombination and repair 2. Ch 27

**Class 7,** Wednesday, Sept. 20, 2017  
DNA replication, recombination and repair 3. Ch 28

**Class 8,** Friday, Sept. 22, 2017  
DNA replication, recombination and repair 4. Ch 28

**Class 9,** Monday, Sept. 25, 2017  
Transcription 1. Ch 29

**Class 10,** Wednesday, Sept. 27, 2017  
Transcription 2. Ch 29

**Class 11,** Friday, Sept. 29, 2017  
Transcription 3. Ch 29

**Class 12,** Monday, Oct. 2, 2017
Test Review

**Class 13**, Wednesday, Oct. 4, 2017

**Test #1** (Covering all of Dr. Singh’s lectures)

**Class 14**, Friday, Oct. 7, 2017

**No class**

Midterm week - Oct 10-14th (no classes)

**Case Study + Class Discussions:** Studying genetic brain disorders to identify new medications

*A human neurodevelopmental model for Williams syndrome.* Nature. 2016 Aug 18; 536(7616):338-43. (Please read paper prior to class)

**Class 15** – Monday, Oct. 16, 2017

**Class 16** – Wednesday, Oct. 18, 2017

**Class 17** – Friday, Oct. 20, 2017

**Classes 18-32 by Dr. Hope.**

**Class 18**, Monday, Oct 23, 2017
Molecular Cloning I, Ch 27

**Class 19**, Wednesday, Oct. 25, 2017
Molecular Cloning II. Ch 27

**Class 20**, Friday, Oct. 27, 2017
Molecular Cloning III. Ch 27

**Class 21**, Monday, Oct. 30, 2017
Translation I. Ch 30

**Class 22**, Wednesday, Nov. 1, 2017
Translation II, Ch 30

**Class 23**, Friday, Nov. 3, 2017
Translation III, Ch 30

**NOTE:** No classes on Monday Nov. 6 or Wednesday Nov. 8

**Class 24**, Friday, Nov. 10, 2017
Post-transcriptional Regulation of Gene Expression I, Ch 31

**Class 25**, Monday, Nov. 13, 2017
Post-transcriptional Regulation of Gene Expression II, Ch 31

**Class 26**, Wednesday, Nov. 15, 2017
Post-transcriptional Regulation of Gene Expression III, Ch 31

**Class 27**, Friday, Nov. 17, 2017
TEST REVIEW

**Class 28**, Monday, Nov. 20, 2017

**Test #2** (Covering all of Dr. Hope’s lectures)
Classes 29-32 by Dr. Hope.

Class 29 – Wednesday, Nov. 22, 2017

Case Study + Class Discussion: Studying Stem Cells for Health Care Applications


Class 30 – Friday, Nov. 24, 2017
Class 31 – Monday, Nov. 27, 2017
Class 32 – Wednesday, Nov. 29, 2017

After Wednesday, Nov. 29th, there are no more classes for Biochemistry 2B03
Please use the time following this to study for the final exam.

Final Exam - Date: TBA. Content: All lecture materials by Drs. Hope and Singh (the group assignment is NOT on the final exam).

Group project--Self-directed learning, group learning, discussion and writing assignment:

Papers: We have selected two recent research articles that cover a broad range of nucleic acids related topics and techniques as the basis for our group projects.

Paper 1. TAs- Vickie Kwan and Brianna Unda
Background for this paper:

Paper 2. TAs- Nadeem Murtaza and Mohammed Almakadi
Background for this paper:

2. Responsibilities of students
Each student should sign up for one of the ~36 groups we expect. Half of the groups will be assigned one paper; the other half of the groups will be assigned the other paper. Each
student can sign up in Avenue to Learn on Sept. 20 at 10 pm. You must sign up by Sept. 27 at 10 pm (the site will be closed then and you will be assessed a 5% penalty). You can sign up for a group according to your interest; however, each group can have maximal 5 students. Therefore, you should be prepared to have a second or third choice.

Each group must select a group leader who will be in charge of group activities; otherwise the instructors will arbitrarily select a group leader. Please e-mail the name and contact information of the group leader (name, email and phone – for emergency use only) to Laura De Rooij and your designated TA for the paper chosen by Sept 28. A teaching assistant is available to work with students on a given paper and the TA will function as a resource person for guidance.

Each group needs to work together to answer questions related to their paper as part of the inquiry-based group project. Some of the questions are technique oriented and others are of problem solving in nature. The answer to many of these questions can only be found from inquiry. To facilitate discussion of the paper assigned, each group must contact their TA to set up two mandatory meetings for the group written assignment, one in October and one in November. These two meetings are required as part of 2.5% marks on attendance and participation. It is everyone’s responsibility to be an active member of your group and to make sure that YOU ABSOLUTELY UNDERSTAND THE PAPER ASSIGNED AND KNOWS DETAILS. Do NOT attend the tutorial sessions without reading your assigned paper. The goal is to facilitate discussion between members of the inquiry group; it is not for the TA’s to provide answers to the assignment questions. The first session is 30 min, while the second session is 60 min.

Be aware that your written answers will be screened for plagiarism using computer software. Each group leader should e-mail Laura De Rooij and your designated TA, the written answers to the questions given (in a Word file – please make sure to properly identify group number and group member names on the document) by Wednesday, Nov. 22nd at 5 pm. Late submissions will be assessed a 5% penalty.