Biochem 2B03 (2013/14)

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 be using 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 liying@mcmaster.ca. You must then contact Dr. Yingfu Li immediately (normally within 2 working days) by email at liying@mcmaster.ca 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.

6) Students will be required to deliver a seminar outside of regular class hours.

Instructors:
Dr. Yingfu Li, Course Coordinator
HSC 4H31, Ext. 22462, please send email to liying@mcmaster.ca

TAs:
Monica Pillon, pillonmc@mcmaster.ca, topic 1 inquiry - Nature (2012) 486, 368-374.
Zohaib Ghazi, zohaib.ghazi@gmail.com, topic 2 inquiry - Science (2012) 335, 233-235.
Qian Feng, qianfeng0116@gmail.com, topic 4 inquiry – Nature (2012) 491, 254-258.
Lydia Ephraim, lydia_ephraim@yahoo.com, logistics, marking tests and exam

Lectures:
Mon., Wed., 8:30-9:20 am; Fri., 10:30-11:20 am

Location:
KTH B135

Course Textbook:
Biochemistry, Garrett & Grisham, Canadian Edition (recommended).

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%
Friday, Oct. 4, 2013, exact time: TBA. This test will be on the materials covered in lectures 1-11.

Test 2: 25%
Friday, Nov. 8, 2013, exact time: TBA. This test will be on the materials covered in lectures 13-23.

Group Project: 20%
5% will be on attendance and participation, 10% on your answers to the questions, and 5% on presentation. Additional 5% will be awarded for a group selected for class presentation for each topic (upon successful completion of class presentation).

Final Exam: 30%
5% will be the materials covered by Dr. Li, 20% will be on the project assigned, 5% will be on other projects.

**Detailed schedule:**

**Class 1**, Monday, Sept. 9, 2013  
Opening class and general discussion.

**Class 2**, Wednesday, Sept. 11, 2013  
Nucleotides and nucleic acids 1. Ch 24-25

**Class 3**, Friday, Sept. 13, 2013  
Nucleotides and nucleic acids 2. Ch 24-25.

**Class 4**, Monday, Sept. 16, 2013  
Nucleotides and nucleic acids 3. Ch 24-25.

**Class 5**, Wednesday, Sept. 18, 2013  
Molecular cloning 1. Ch 27.

**Class 6**, Friday, Sept. 20, 2013  
Molecular cloning 2. Ch 27.

**Class 7**, Monday, Sept. 23, 2013  
DNA replication, recombination and repair 1. Ch 28

**Class 8**, Wednesday, Sept. 25, 2013  
DNA replication, recombination and repair 2. Ch 28

**Class 9**, Friday, Sept. 27, 2013  
DNA replication, recombination and repair 3. Ch 28

**Class 10**, Monday, Sept. 30, 2013  
DNA replication, recombination and repair 4. Ch 28

**Class 11**, Wednesday, Oct. 2, 2013  
DNA replication, recombination and repair 5. Ch 28

**Class 12, Friday, Oct. 4, 2013, TEST #1.**

**Class 13**, Monday, Oct. 7, 2013  
Transcription 1. Ch 29

**Class 14**, Wednesday, Oct. 9, 2013  
Transcription 2. Ch 29

**Class 15**, Friday, Oct. 11, 2013  
Transcription 3. Ch 29

**Class 16**, Wednesday, Oct. 16, 2013  
Transcription 4. Ch 29

**Class 17**, Monday, Oct. 21, 2013  
Transcription 5. Ch 29

**Class 18**, Wednesday, Oct. 23, 2013  
Translation 1. Ch 30

**Class 19**, Friday, Oct. 25, 2013  
Translation 2. Ch 30

**Class 20**, Monday, Oct. 28, 2013  
Translation 3. Ch 30

**Class 21**, Wednesday, Oct. 30, 2013  
Translation 4. Ch 30

**Class 22**, Monday, Nov 3, 2013
Class 24: Friday, Nov. 8, 2013.
TEST #2.

Class 25, Monday, Nov. 11, 2013
Group project time
Class 26, Wednesday, Nov. 13, 2013
Group project time.
Class 27, Friday, Nov. 15, 2013
Group project time.
Class 28, Monday, Nov. 18, 2013
Group project time.
Class 29, Tuesday, Nov. 19, 2013
Competition 1 2-7 pm (topic 1 groups; to be scheduled consecutively for 1 hour slot).
Class 30, Wednesday, Nov. 20, 2013
Competition 2 2-7 pm (topic 2 groups; to be scheduled consecutively for 1 hour slot).
Class 31, Thursday, Nov. 21, 2013
Competition 3 2-7 pm (topic 3 groups; to be scheduled consecutively for 1 hour slot).
Class 32, Friday, Nov. 22, 2013
Competition 4 2-7 pm (topic 1 groups; to be scheduled consecutively for 1 hour slot).
Class 33, Monday, Nov. 25, 2013
Student lecture 1
Class 34, Wednesday, Nov 27, 2013
Student lecture 2
Class 35, Friday, Nov 29, 2013
Student lecture 3
Class 36: Monday, Dec. 4
Student lecture 4

Exam - Date: TBA. All TAs need to attend.

Group project--Self-directed learning:
1. Papers: We have selected four recent research articles that cover a broad range of nucleic acids related topics and techniques as the basis for our group projects. The topics are:

   Paper 1. Structure of yeast Argonaute with guide RNA. Nakanishi K, Weinberg DE, Bartel DP, Patel DJ. Nature. 2012, 486, 368-74. **Five groups (1A through 1E) will be selected for this paper.**

   Paper 2. Widespread genetic switches and toxicity resistance proteins for fluoride. Baker JL, Sudarsan N, Weinberg Z, Roth A, Stockbridge RB, Breaker RR. Science. 2012, 335, 233-235. **Five groups (2A through 2E) will be selected for this paper.**

Duncan SH, Flint HJ, Clark TG, Parkhill J, Dougan G. PLoS Pathog. 2012, 8, e1002995. **Five groups (3A through 3E) will be selected for this paper.**


2. **Responsibilities of students**

   **Each student should sign up for one of the 20 groups.** Each student can sign up in Avenue to Learn on **Sept. 18** at 9 pm sharp (the group sign-up sheets will be released to you at that time). You must sign up by **Sept. 25** at 10 pm (the sheets will be closed then and you will be assessed a 5% penalty). You can sign up for a group according to your interest; however, only five groups can select a given paper and each group can only have maximal 9 students. Therefore, you should be prepared to have a second or third choice (please list the 20 groups in order of preference, such as 1A, 2C, 2D, etc., when signing up). **Note – you must choose a group such that you will not be in conflict with your Biochem 21.06 laboratory.** Thus, if you have a lab session on **Tuesday** you must choose topic 2 or 3 or 4 and if you have a lab session on **Thursday** you must choose topic 1 or 2 or 4. Scheduling is tight and it may not be possible to avoid all the conflicts with individual lectures.

   **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 Dr. Li liying@mcmaster.ca by **Sept 30**. 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 some questions related to the paper.** 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. Be aware that your written answers will be screened for plagiarism using computer software. Each group should e-mail Dr. Li the written answers to the questions given (in Word file) by **Tuesday, Nov. 26 at 4 pm**. Late submissions will be assessed a 5% penalty.

   **Each group also needs to put together a 30-minute (± 5 minutes) PowerPoint presentation and present it to the TAs and the instructors on Nov. 19/20/21/22 at a specific time given in the table below – for example, 1A will present at 2 pm on Nov. 19 and 3D at 5 pm on Nov. 21.** The presentation will be followed by a short question/answer period to all the members of the group. Each group must email Dr. Li a PowerPoint presentation file by **5 PM Monday, Nov. 18** (or put it on a USB disk and give it to Dr. Li). Please note that the presentation time to the instructors and TAs cannot be changed, so when you sign up for a particular group, consider any conflicts with your own schedule. Absolutely no re-scheduling will be given once the groups are set and all members of the groups must attend their presentations.

   **Each group must contact their TA to set up two mandatory meetings,** one in October and one in November. These two meetings are required as part of 5% marks on attendance and participation.
Each presentation will be evaluated by TAs and Dr. Li on the basis of **clarity, creativity, accuracy** and **quality** of the presentation. One group will be selected to present each topic to the entire class. The winning group will receive an extra 5% to their final mark. However, each group has to be prepared to give a presentation in a scheduled class during which the competition results will be announced. Everybody must attend all the presentations to the class, even if they are not the presenters. Attendance will be randomly checked, please bring your ID to class.

A significant portion of your final marks (45%) relates to the group project, speaking to its importance. The group project needs a term-long effort and each group should start to work on its project as early as possible. 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 CRUCIAL DETAILS**, in order to do well in the final exam.
Group presentation time and group leader information:

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