BIOCHEM 2B03 (Fall 2024): Nucleic Acid Structure and Function

Land acknowledgement:

McMaster University is located on the traditional territories of the Mississauga and Haudenosaunee nations, and within the lands protected by the "Dish with One Spoon" wampum agreement.

We seek a new relationship with the original peoples of this land, one based in honour and deep respect. May we be guided by love and right action as we transform our personal and institutional relationships with our indigenous friends and neighbours.

Course instructors: Dr. Yingfu Li (liying@mcmaster.ca) and Dr. Monica De Paoli (depaolim@mcmaster.ca)

Lectures schedule:

Lecture schedule and locations will be available on A2L and Mosaic.

Course Textbook: Biochemistry – The Molecular Basis of Life, Seventh Edition, Trudy McKee and James R.McKee (optional)

Course objectives:

Welcome to Biochemistry 2B03!

This is a one term course with three classes each week.

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 important, nucleic acids research has 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 way DNA replicates 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, you will be given opportunities, through inquiry projects, to learn how our human creativity and imagination has led to numerous important scientific findings in nucleic acids research.

Teaching Assistants:

We will have six amazing TAs helping out with the course:

TA1	Topic 1 (Scientific Discoveries/Forensics)
TA2	Topic 2 (Research techniques)
TA3	Topic 3 (Famous scientists)
TA4	Topic 4 (Canadian biochemists)
TA5	Topic 5 (COVID-19/HIV)

Their contact information will be shared with you on A2L and they will guide you through your inquiry projects.

Course schedule:

Please note that this is an in-person lecture, and **attendance is expected**. Lectures will be recorded and posted on A2L should you not be able to attend class. **Test 1, Test 2, and Test 3 require in-person attendance**. Absence from the test requires the use of a MSAF.

Week 1	Tuesday, September 3: Welcome and course introduction Wednesday, September 4: Nucleic Acids part 1/Quiz 1 Friday, September 6: Nucleic Acids part 2/Quiz 2
Week 2	Tuesday, September 10: Nucleic Acids part 3/Quiz 3 Wednesday, September 11: Q&A session/Quiz 4 Friday, September 13: Nucleic Acids part 4/Quiz 5
Week 3	Tuesday, September 17: Genetic information part 1/Quiz 6 Wednesday, September 18: Genetic information part 2/Quiz 7

	Friday, September 20: Genetic information part 3/Quiz 8
Week 4	Tuesday, September 24: Review in preparation for Test 1/Quiz 9 Wednesday, September 25: **TEST 1** Friday, September 27: Genetic information part 4/Quiz 10
Week 5	Tuesday, October 1: Genetic information part 5/ Quiz 11 Wednesday, October 2: Genetic information part 6/Quiz 12 Friday, October 4: : Protein synthesis part 1/Quiz 13
Week 6	Tuesday, October 8: Protein synthesis part 2/Quiz 14 Wednesday, October 9: Practice quiz and Q&A/Quiz 15 Friday, October 11: Protein synthesis part 3/Quiz 16
READING WEEK	**October 14-18, NO CLASSES**
Week 7	Tuesday, October 22: Protein synthesis part 4/Quiz 17 Wednesday, October 23: Protein synthesis part 5/Quiz 18 Friday, October 25: Review in preparation for Test 2
Week 8	Tuesday, October 29: **TEST 2** Wednesday, October 30: Group project time Friday, November 1: Group project time
Week 9	Tuesday, November 5: GROUP PRESENTATIONS (CB GROUPS 1 AND 2) Wednesday, November 6: GROUP PRESENTATIONS (CB GROUPS 3 AND 4) Friday, November 8: GROUP PRESENTATIONS (RT GROUPS 1 AND 2)

Week 10	Tuesday, November 12: GROUP PRESENTATIONS (RT GROUPS 3 AND 4) Wednesday, November 13: GROUP PRESENTATIONS (SD GROUPS 1 AND 2) Friday, November 15: GROUP PRESENTATIONS (NAFS GROUPS 1 AND 2)
Week 11	Tuesday, November 19: GROUP PRESENTATIONS (COVID-19 GROUPS 1 AND 2) Wednesday, November 20: GROUP PRESENTATIONS (HIV GROUPS 1 AND 2) Friday, November 22: GROUP PRESENTATIONS (FS GROUPS 1 AND 2)
Week 12	Tuesday, November 26: GROUP PRESENTATIONS (FS GROUPS 3 AND 4) Wednesday, November 27: Free study time Friday, November 29: Free study time
Week 13	Tueday, December 3: Free study time Wednesday, December 4: **TEST 3**

Please note the following:

- Q&A sessions: you can use this time to ask questions, review the class material, and/or to take the in-class quiz.
- Before Tests 1 and 2 we will have a review session with practice tests. Test 1 will cover lectures from week 1-4; Test 2 will cover all lectures from week 1-7; Test 3 will cover the group presentations.
- Group project time days: there will be no class, please use that time to work on your group project assignments.
- Free study time: there will be no class, please use that time to study in preparation for Test 3.

Assessments overview:

Assessment name	Weight	Due date
In class quiz	15%	Weekly
Test 1	20%	**September 25, 2024**
Test 2	20%	**October 29, 2024**
Individual Project	12% (Essay 6%; YouTube video 6%)	October 21, 2024
Group Project	25% (Essay 10%, Presentation 12%, Participation 3%)	Essay due: November 4, 2024 Presentations according to the course schedule
Test 3	8%	**December 4, 2024**

In class quiz (15%): these are short quizzes (multiple choice) to assess your understanding of the content explained in class. These quizzes will be available on A2L after the lecture and will be accessible for up to 2 days after class. You can take the test after class but will only be allowed one attempt. There are a total of 18 quizzes, and we will discard the bottom three.

Test 1 (20%): this test will be administered via A2L however **it must be taken in person, in class** (please see the course schedule for dates and times). It will consist of multiple choice questions. Should you not be able to attend, an MSAF will be required to write a make-up test.

Test 2 (20%): this test will be administered via A2L however **it must be taken in person, in class** (please see the course schedule for dates and times). It will consist of multiple choice and short answer questions. Should you not be able to attend, an MSAF will be required to write a make-up test.

Individual project (12%)- essay 6% + YouTube video 6% : Each student in the group needs to select a specific item that fits within the main theme of the group, and conduct independent research on this item. For this part of the inquiry project, you will need to produce two outcomes that will be marked by your TA – a 2-page (single-spaced, Arial, Font 12) essay on this item and a YouTube clip (max time 2.5 minutes) to complement the essay. The weight of the two outcomes is worth 6% each. Name your video as "Your Name Topic (5 words or less) Biochem 2B03 2024", such as "Monica De Paoli Story of Michael Smith Biochem 2B03 2024". Keep your clip under 100 MB. Name your essays as "Your Name Item name (5 words or less) Biochem 2B03 2024". Be aware that your essays will be screened for plagiarism using computer software. Submit your individual essay (a Word file) and your YouTube clip to A2L by the due date outlined in the assignments table.

Group project (25%) - essay 10% + presentation 12% + participation 3%: Each group must collaboratively pick a topic that fits in the assigned theme as the main focus of the group project. To help you with the choice of the topic, each group must contact their TA to set up ONE mandatory meeting before **Monday September 30, 2024**. The session can be up to an hour (but a minimum of 30 minutes to be able to appropriately answer questions from the students). This meeting is required as part of the 3% marks on attendance and participation. **Each group will focus on this topic as a group project.** For this part of inquiry, you will need to produce two outcomes: a 5-page (single-spaced, Arial, Font 12) essay on this topic (10%) and a PowerPoint file for a **15-minute** presentation with detailed script for each slide. Essays will be screened for plagiarism using computer software. The group leader should submit your group essay in a Word file to A2L by **Monday November 4, 2024**. Name your essays as "Your Group Name Topic (5 words or less) Biochem 2B03 2024". Each group leader should also upload your group PowerPoint file to A2L on the day of your presentation. Name your file as "Group Name Topic (5 words or less) Biochem 2B03 2024". The PowerPoint file should also include the detailed script of your presentation so that everyone can use it as study material for Test 3. The presentation will be 15 minutes plus 5 minutes questions. Your in-class presentation will be marked by your TA and the two instructors (12% of the mark). All group members should be actively presenting their work. The class is strongly encouraged to ask questions during presentations. Each group will also need

to create 3 multiple choice questions and send them to Dr. Li on the day of your presentation (see the course schedule). Some of these questions will be modified and used for Test 3. **Both the group essay and the presentation must clearly state the contribution of each member of the group**. Everyone must attend the TA meeting and be present at your presentation to get 3% participation mark (you don't get any participation mark if you miss the TA meeting or your presentation). It is everyone's responsibility to be an active member of your group and to make sure that you fully understand the topic you are presenting and know the relevant details.

Themes for group project:

Topic 1 (TA1) – Scientific Discoveries (SD) An important discovery related to nucleic acids **/Nucleic Acids in Forensic Science (NAFS)**. How nucleic acids can help in forensic science

Topic 2 (TA2) – Research techniques (RT). A widely used research technique related to nucleic acids

Topic 3 (TA3) – Famous scientists (FS). Life and contributions of a scientist who made ground-breaking discoveries related to nucleic acids.

Topic 4 (TA4) – Canadian biochemists (CB). Life and research of a Canadian scientist who has worked or is doing research related to any material covered in the lectures.

Topic 5 (TA5) – COVID-19/HIV. Biochemistry, variants of concern, vaccines, therapeutics and diagnostics related to SARS-CoV-2 or HIV.

Groups will be randomly created and assigned to the topics using A2L. All groups will be made up of 9-11 group members. Each group must select a group leader who will be in charge of group activities otherwise Drs. Li/De Paoli will arbitrarily select a group leader. Please e-mail the name and contact information of the group leader (name and email address) to **Dr. Yingfu Li and your designated teaching assistant (TA) by Friday Sept. 27, 2024.** Your TA will function as a resource person for guidance on your selected topic.

Statement on the use of Generative Artificial Intelligence in the course:

Students are not permitted to use generative AI in this course. In alignment with McMaster academic integrity policy, it "shall be an offence knowingly to … submit academic work for assessment that was purchased or acquired from another source". This includes work created by generative AI tools. "Contract Cheating is the act of "outsourcing of student work to third parties" (Lancaster & Clarke, 2016, p. 639) with or without payment." Using Generative AI tools is a form of contract cheating. Charges of academic dishonesty will be brought forward to the Office of Academic Integrity.

A note from your instructors…

Along with our expectations as your instructors, we want to share with you our teaching and learning beliefs:

- We want this course and our classes to be a safe, respectful, and welcoming space where you can learn, build your confidence, and bring out the best in you
- We would like you to feel engaged and curious about the topics
- We value your feedback and we believe it is very important for the success of this course: you are the co-pilots in this learning journey!
- Last, but not least, we are always happy to hear from you. If you have any concerns related to this course or personal reasons, please don't hesitate to reach out. There might be times where we go through struggles for various reasons, but you should never feel like you are facing this alone. Should you go through some difficult times we encourage you to talk to us so that we can make appropriate accommodations.

Finally, we encourage you to reflect on what your course expectations will be, what your course goals and future goals are, and what your learning beliefs are. Feel free to share these in class whenever you see fit.

Course Policies:

Late Work

Grace period for individual assignment is 48 hours, there is no grace period for your group presentation.

What is a grace period? A grace period means there will be no late penalty for submissions handed in up to 48 hours after the due date (deadline at 11:59 pm 48 hours past the original due date). There is no need to email or MSAF, the A2L dropbox simply remains open.
Use the grace period for any reason, no questions asked. If your internet breaks as you are handing in your assignment at the end of the grace period, that is unfortunate, but the end of the grace period is the end. Please hand it in sooner to allow for that kind of problem, that is what the grace period is for.

Please note that if multiple submissions are handed in, the most recent one will be graded, no need to email your instructor and/or your TA.

A MSAF results in an additional 5 days to complete your work (5 days after the end of the grace period, with submission deadline at 11:59pm), not cancellation of that work. If you miss the grace period and still wish to hand in work you must use a MSAF.

Please note that after the grace period, unless a MSAF is presented, there will be a 10% deduction per day, including weekends.

Remarking Work

Please note that upon publishing your assignment's mark, questions to TAs (should you have any) must be sent after 2 business days from publication. Should you request your work to be regraded, regrading will be considered only if requested within 10 days from publication.
If you would like to have any work regraded, please adhere to the Department of Biochemistry and Biomedical Sciences Regrading Policy available here:
https://biochem.healthsci.mcmaster.ca/education/undergraduate/forms-and-procedures/

REQUESTS FOR RELIEF FOR MISSED ACADEMIC TERM WORK

MCMASTER STUDENT ABSENCE FORM (MSAF): In the event of an absence for medical or other reasons, students should review and follow the Academic Regulation in the Undergraduate Calendar "Requests for Relief for Missed Academic Term Work".

ACADEMIC ACCOMMODATION OF STUDENTS WITH DISABILITIES. Students with disabilities who require academic accommodation must contact Student Accessibility Services (SAS) at 905-525-9140 ext. 28652 or sas@mcmaster.ca to make arrangements with a Program Coordinator. For further information, consult McMaster University's *Academic Accommodation of Students with Disabilities* policy.

ACADEMIC ACCOMMODATION FOR RELIGIOUS, INDIGENOUS OR SPIRITUAL OBSERVANCES (RISO).

Students requiring academic accommodation based on religious, indigenous or spiritual observances should follow the procedures set out in the RISO policy. Students should submit their request to their Faculty Office **normally within 10 working days** of the beginning of term in which they anticipate a need for accommodation **or** to the Registrar's Office prior to their examinations. Students should also contact their instructors as soon as possible to make alternative arrangements for classes, assignments, and tests.

COURSES WITH AN ON-LINE ELEMENT. Some courses may use on-line elements (e.g. e-mail, Avenue to Learn (A2L), LearnLink, web pages, capa, Moodle, ThinkingCap, etc.). Students should be aware that, when they access the electronic components of a course using these elements, 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 a course that uses on-line elements will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure, please discuss this with the course instructor.

ONLINE PROCTORING. Some courses may use online proctoring software for tests and exams.

This software may require students to turn on their video camera, present identification, monitor and record their computer activities, and/or lock/restrict their browser or other applications/software during tests or exams. This software may be required to be installed before the test/exam begins.

ACADEMIC INTEGRITY. 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. **It is your responsibility to understand what constitutes academic dishonesty.**

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. For information on the various types of academic dishonesty please refer to the *Academic Integrity Policy,* located at https://secretariat.mcmaster.ca/university-policies-procedures-guidelines/

The following illustrates only three forms of academic dishonesty: plagiarism, e.g. the submission of work that is not one's own or for which other credit has been obtained.
improper collaboration in group work, copying or using unauthorized aids in tests and examinations.

AUTHENTICITY / PLAGIARISM DETECTION. Some courses may use a web-based service (Turnitin.com) to reveal authenticity and ownership of student submitted work. For courses using such software, students will be expected to submit their work electronically either directly to Turnitin.com or via an online learning platform (e.g. A2L, etc.) using plagiarism detection (a service supported by Turnitin.com) so it can be checked for academic dishonesty.

Students who do not wish their work to be submitted through the plagiarism detection software must inform the Instructor before the assignment is due. No penalty will be assigned to a student who does not submit work to the plagiarism detection software. **All submitted work is subject to normal verification that standards of academic integrity have been upheld** (e.g., on-line search, other software, etc.). For more details about McMaster's use of Turnitin.com please go to the

McMaster Office of Academic Integrity's webpage.

CONDUCT EXPECTATIONS. As a McMaster student, you have the right to experience, and the responsibility to demonstrate, respectful and dignified interactions within all of our living, learning and working communities. These expectations are described in the *Code of Student Rights & Responsibilities* (the "Code"). All students share the responsibility of maintaining a positive environment for the academic and personal growth of all McMaster community members, whether in person or online.

It is essential that students be mindful of their interactions online, as the Code remains in effect in virtual learning environments. The Code applies to any interactions that adversely affect, disrupt, or interfere with reasonable participation in University activities. Student disruptions or behaviours that interfere with university functions on online platforms (e.g. use of Avenue 2 Learn, WebEx or Zoom for delivery), will be taken very seriously and will be investigated. Outcomes may include restriction or removal of the involved students' access to these platforms.

COPYRIGHT AND RECORDING. Students are advised that lectures, demonstrations, performances, and any other course material provided by an instructor include copyright protected works. The Copyright Act and copyright law protect every original literary, dramatic, musical and artistic work, including lectures by University instructors.

The recording of lectures, tutorials, or other methods of instruction may occur during a course. Recording may be done by either the instructor for the purpose of authorized distribution, or by a student for the purpose of personal study. Students should be aware that their voice and/or image may be recorded by others during the class. Please speak with the instructor if this is a concern for you.

EXTREME CIRCUMSTANCES. The University reserves the right to change the dates and deadlines for any or all courses in extreme circumstances (e.g., severe weather, labour disruptions, etc.). Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, A2L and/or McMaster email.

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