

Syllabus - Nucleic Acid Chemistry (Chem 425 / 625) - Fall 2018

Instructor: Dr. Christopher J. Wilds

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Time & Location: Wednesday and Friday 10:15 - 11:30 AM in CC-314

Office Hours: Wednesdays from 3:00 - 4:00 PM (or by appointment)

Course Description: This is an advanced undergraduate / graduate level course dealing with a number of topics pertaining to the field of nucleic acids including: Nomenclature, heterocycle and nucleoside synthesis, solid-phase synthesis, methods of purification and characterization of oligonucleotides, DNA and RNA structure, therapeutic applications of synthetic oligonucleotides (antisense, antigene and RNAi), interaction of small molecules with nucleic acids, DNA damage and repair. Concepts will be presented in a lecture style format and reinforced through classroom discussion of articles from scholarly journals.

Course materials: On reserve at Vanier Library (3-hour reserve):

Nucleic Acids in Chemistry and Biology (third edition)

G. Michael Blackburn, Michael J. Gait, David Loakes and David M. Williams (Editors), The Royal Society of Chemistry, Cambridge (UK), 2006.
(recommended)

Notes and journal articles will be supplied by the instructor and will be available through the Chem 425 / 625 Moodle website.

Grading*:

	Grade
Midterm Exam (in class, 1 ¼ hour, October 31)	25 %
Term Paper (due date of October 26 by 4 PM)	15 %
Presentations (November 2, 7, 9, 14, 16 and 21)	10 %
Participation	5 %
Final Exam (cumulative, date TBA)	45 %

* Graduate students taking this course will have additional questions to answer on the Midterm and Final Exams.

In the event of extraordinary circumstances beyond the University's control, the content and/or evaluation scheme in this course is subject to change.

If you miss a class test due to a medical emergency or a death in the immediate family you must (1) email me immediately and (2) provide me with a medical certificate or death certificate within 4 days of the missed exam. If the document is valid, then the final exam will count for both. No other reason for missing an exam will be accepted.

Term Paper & Presentation Instructions

Term Paper - General Instructions:

The term paper is worth 15 % of the course grade.

Each student will select a topic pertaining to the field of nucleic acid chemistry (with an emphasis on chemistry). You must also find a recent manuscript (published after January 2013) that has appeared in a peer-reviewed journal (Journal of the American Chemical Society, Nucleic Acids Research, Nature Chemistry, etc.) as an example of a recent advancement in this field (so if you have selected antisense therapeutics as a topic, you must also include in your term paper a description of a recent research article from a peer reviewed publication related to antisense). Once you have selected your topic and the manuscript, email it and set up a meeting with the course instructor in order to obtain permission for your topic (to ensure that there is no topic duplication with your colleagues, lecture content from the instructor or another course).

FAILURE TO SELECT A TOPIC AND MEET WITH THE INSTRUCTOR BY FRIDAY, OCTOBER 19, 2018 (BEFORE 5 PM) WILL RESULT IN A PENALTY OF 25 % FOR THE TERM PAPER – THERE WILL BE NO EXCEPTIONS! IT IS HIGHLY RECOMMENDED THAT YOU SELECT YOUR TOPIC AS SOON AS POSSIBLE.

The term paper is due in my office by **4 PM** on **October 26, 2018**. There will be a penalty for papers not submitted on time (a reduction of 10 % of the final grade for the paper every day it is late).

In no case is it acceptable to plagiarize from books, journal articles, from another person's work or from web sources. Papers that contain plagiarized passages will receive a grade of zero. References should be from peer-reviewed journal articles, reviews or book chapters (no internet / web page references for the text).

Your paper should be written describing your topic, its importance / relevance to nucleic acid chemistry, any necessary background principles related to the topic and discussion of the manuscript that you have selected highlighting the experiments performed, the results obtained and a critical assessment of what advances that the work has contributed to the field. It should not be a summary of only the recent manuscript you have selected.

Term Paper - Format:

The term paper must not exceed 20 pages in length. It should be typed, 1 ½ line-spaced, with 12-point font and 1 ¼ inch margins around with page numbers on the bottom.

Include copies of the 2 or 3 most significant references to attach to the term paper. The term paper should be handed in as a bound copy and will not be returned.

Ideas should be cited properly from peer reviewed journals and books (no internet sources). For journal articles, a suggested format is:

Smith, J.S., and Nikonowicz, E.P. (2000) *Biochemistry* 39, 5642-52.

For books:

Wimenga, S.S., Mooren, M.M.W. and Hilbers, C.W. (1993) in *NMR of Macromolecules, A Practical Approach* (Roberts, G.C.K., Ed.) pp 217-288, Oxford University Press, New York.

Term Paper - Evaluation:

The evaluation scheme for the term paper will be:

POINTS

Originality	5
Challenge of the topic	5
Relationship to nucleic acids/chemistry	5
Overall (thorough) survey of topic / field	30
Appropriate use of figures	5
Discussion of the manuscript	10
Critical analysis of the manuscript	10
Conclusions	10
Extent of background research	5
Organization	5
Length	5
Typeset	5
TOTAL	100

Presentation - General Instructions:

On the dates of November 2, 7, 9, 14, 16 and 21 there will be student presentations worth 10 % of your final grade. These presentations should last approximately 15 minutes (with a few minutes afterwards for questions) on the topic of your term paper using Powerpoint. If your presentation goes beyond 15 minutes you will be penalized. A sign up sheet will be circulated in class for you to rank your preference in dates. Prepare to be asked questions regarding your presentation by the instructor and your fellow classmates (part of the participation grade will be based on this - see below). You will be evaluated on the introduction and description of your topic, the organization of your presentation and its appearance, explanation of key concepts and figures used in your presentation, highlights of key results from the manuscript you have selected and a critical assessment of the advancement to the field and your responses to questions from the instructor and colleagues in class.

CLASS PARTICIPATION

Students are expected to attend the lectures, read the articles that are handed out and contribute to the discussion of these articles. It is expected that cell phones be silent and put away during the lecture. Also, checking email, playing games, browsing the internet, etc. on laptops during the lecture is prohibited.

It is expected that students attend all the presentations given by their colleagues that will be held towards the end of the course. Be prepared to ask your colleagues questions regarding their presentations.

Failure to abide by these guidelines will influence your class participation grade.

MANDATORY QUIZ AND SEMINAR

As part of this course, you are **required** to i) attend a Chemistry and Biochemistry Departmental Seminar on the academic conduct code and the appropriate use of information sources and ii) pass the online quiz associated with this seminar (the passing grade for the quiz is 100%). (**Note:** This is **not** the University's quiz you may have been asked to take when you first registered and logged into the myConcordia portal; the one you must take is similar, but graded by the Department of Chemistry and Biochemistry, and you do not have access to it until after you have attended the seminar.) The aim of this seminar is to clarify the academic conduct code in terms of what practices will be considered unacceptable with regards to work submitted for grading in Chemistry and Biochemistry courses. **You are only exempt from repeating the seminar and the quiz if you have done both in Fall 2013 or more recently,*** otherwise you are required to repeat both this term. This short seminar (1 hour) will be held at the following times (note that late-comers will **not** be admitted):

Date	Time	Place
Monday, Sept. 24	16:45-17:45	HC 155
Tuesday, Sept. 25	16:45-17:45	CC 116
Tuesday, Sept. 25	20:45-21:45	HB 130
Wednesday, Sept. 26	16:45-17:45	HC 155
Wednesday, Sept. 26	20:45-21:45	SP S110
Thursday, Sept. 27	16:45-17:45	CC 115
Friday, Sept. 28	16:45-17:45	HB 130

As space for each of the seminars is limited by the room size, please **sign up** to your preferred time as soon as possible (slots fill up quickly). Sign-up sheets are available two weeks in advance of the seminars outside SP 201.01 (Departmental office). Only sign up in **available slots**: rooms must not be filled over capacity!

If you do not complete this course requirement, your final grade for the course may be lowered by one full letter grade with an incomplete (INC) notation until such time as this requirement is completed. Please refer to the undergraduate calendar (section 16.3.6) for details on removal of an incomplete notation.

* You are exempt if you can locate your ID in the pdf file located on the Departmental web site (<http://www.concordia.ca/content/dam/artsci/chemistry/docs/Compliance-list.pdf>).

Plagiarism and Other Forms of Academic Dishonesty:

The Academic Code of Conduct can be found in section 17.10 of the academic calendar (<http://www.concordia.ca/academics/undergraduate/calendar/current/17-10.html>). Any form of unauthorized collaboration, cheating, copying or plagiarism found in this course will be reported and the appropriate sanctions applied. The mandatory seminar is a clear and fair opportunity to learn what our faculty regards as academic misconduct. Failure to take part in this learning opportunity and thus ignorance of these regulations is no excuse and will not result in a reduced sanction in any case where academic misconduct is observed.

CHEM 425 / 625 SCHEDULE – FALL 2018 Term dates: September 4 – December 19, DEADLINE TO WITHDRAW WITH TUITION REFUND = September 17, LAST DATE TO DROP CLASS (DISC) = November 5

Date	Topic	Chapters in Blackburn, Gait, Loakes & Williams (3 rd ed)
September 5	Introduction / DNA and RNA structure	Ch. 1 p. 1-12 Ch. 2 p. 13-33, 56-62 Ch. 7 p. 253-263
September 7		
September 12	Nucleoside synthesis	Ch. 3 p. 77-82, 84-85, 98-99
September 14		
September 19		
September 21	Oligonucleotide synthesis	Ch. 4 p. 143-156, 158-165
September 26		
September 28	Therapeutic applications of nucleosides and oligonucleotides	Ch. 2 p. 49-55 Ch. 3 p. 125-134 Ch. 4 p. 193-203
October 3		
October 5		
October 10	Techniques applied to nucleic acids	Ch. 11 p. 428-429, 431-432, 433-439
October 12		
October 17		
October 19	Interactions of nucleic acids with small molecules	Ch. 8 p. 296-298, 300-310, 313-325 Ch. 9 p. 342-343, 346-350, 361-366, 375-379
October 24		
October 26		
October 31		
MIDTERM EXAM (1 ¼ hr, 10:15 - 11:30 AM)		
November 2	Student Presentations	
November 7	Student Presentations	
November 9	Student Presentations	
November 14	Student Presentations	
November 16	Student Presentations	
November 21	Student Presentations	
November 23	DNA / protein interactions	Ch. 10 p. 384-391
November 28		
November 30	Review Session for the Final Exam	
FINAL EXAM PERIOD: December 5 - 19		