

# MOLECULAR GENETICS

## APBI/BIOL 3135

### COURSE OUTLINE FALL 2022

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#### Instructor

Dr. Heidi Schraft  
Biology, CB4015  
Phone: 807-343-8010 Ext. 8351  
Email: please contact me through the **email link in the D2L course page**.

#### Office Hours

Tue and Thu 1 pm - 2 pm

I aim to be in my office during the above Office Hours. However, occasionally, I may need to attend other meetings during these times and will not be available. Therefore, I recommend booking an appointment for a meeting.

To book an appointment please [click here](#).

My office is in the Centennial Building, room CB 4015

#### Laboratory Instructors

Christina Richard  
Email: [crichar3@lakeheadu.ca](mailto:crichar3@lakeheadu.ca)

#### Lectures and Tutorial

Lectures:

Tue and Thu 8:30 am – 10:00 am, AT 1006

Laboratory:

Thu 2:30 pm – 5:30 pm, CB 3012

## Textbook

Snyder & Champness Molecular Genetics of Bacteria, 5<sup>th</sup> edition  
by Henkin, T. and Peters, J.; published by Wiley and ASM Press.

The 4<sup>th</sup> edition is oK as well.

Hardcopy is available in the bookstore.

Alternatively, you can purchase/rent an eBook at the Wiley website: [www.wiley.com](http://www.wiley.com)

The 4<sup>th</sup> edition is available on reserve in the library.

**There will be required reading from the book. I strongly recommend that you have a book available to you throughout the semester.**

## Learning Objectives

Discuss prokaryotic DNA structure, organization and replication (chromosomal DNA and plasmid DNA) with emphasis on molecular mechanisms, replication impediments and coordination of DNA replication with chromosome segregation.

Describe gene expression at the molecular level with emphasis on promoters, translation initiation and termination, *cis* & *trans*-acting factors, and polar effects of translational coupling.

Discuss the molecular mechanisms of gene transfer by conjugation, transformation and transduction. Describe gene transfer experiments and evaluate their data to map genes.

Describe properties of transposons found in bacteria and explain transposition at the molecular level.

Describe, compare and contrast site-specific and homologous recombination, with emphasis on molecular mechanisms and discuss their applications in molecular biology research.

Discuss DNA damage, spontaneous and induced mutations in bacteria and explain their effects on gene expression. Describe prokaryotic responses to DNA damage and mutations. Explain how mutagenesis can be used to understand gene function and metabolic pathways.

Discuss specific and global regulation of gene expression in bacteria. Examine examples of transcriptional, translational and posttranslational gene regulation and explain the functions of selected regulons and stimulons.

Apply molecular biology techniques and bioinformatics tools to clone, sequence and examine the GAPDH gene from a plant.

Please refer to the lecture schedule on the last page for topics covered and to the study guides posted in Desire2Learn (D2L) for each topic's detailed Learning Objectives.

## Performance Evaluation

Activity	Weight
Class Participation Each class: iClicker (occasionally D2L)	7.5%
Laboratory	30%
Mid-term tests Test #1: Tue Oct 4, 2022 Test #2: Thu Nov 10, 2022	30% (2 x 15%)
Final exam During exam period	32.5%
Total	100%

**Please note that all tests and the final exam will be in person.**

## DESIRE2LEARN – D2L

You will have access to a course page through Desire2Learn (D2L) where you'll find course updates, recorded video lectures, the links to the live Zoom meetings, lecture slides, assignments, links to selected web-sites, etc.

To log into your course website:

1. Go to <https://mycourselink.lakeheadu.ca/d2l/home>
2. Enter your Login/ID (your Lakehead University e-mail username) and your Password/PIN number.
3. Click on the course title to enter the course.

If you encounter any difficulties logging into the course site, please contact:

[mycourselink@lakeheadu.ca](mailto:mycourselink@lakeheadu.ca)

## iClicker

I will be using iClicker to make our class time more engaging. This will help me understand what you know, give everyone a chance to participate, and increase how much you learn in class. This will also provide you with feedback on how well you are comprehending course concepts, help you master challenging concepts, and allow you to review material after class.

**Participating in my iClicker sessions will be counted towards the participation component of your final grade.** It will be worth 7.5% of your final grade. You will earn 1 point for each correct question you answer and 0.5 points for each incorrect answer. Likely, 3 - 5 questions will be asked in a 1.5 hour lecture period. For the final iClicker grade calculation, I will drop the two lowest marks. We will start using iClicker in the first week of classes; however only sessions after the last day to add will be used towards the iClicker grade.

You are required to bring a device to participate in the iClicker sessions during class. I will be allowing participation with the iClicker student app on a smartphone, tablet or laptop. It is your responsibility to set up your iClicker account in a timely fashion and register in my iClicker course. It is also your responsibility to regularly check your iClicker records for any discrepancies and bring them to my attention within 48 hours.

In order to participate in my iClicker activities and ensure that your grades are properly reflected in the grade book, please register for iClicker by following the steps listed at the end of this syllabus.

## Missed Exams, Late Assignments and Extensions

I have limited capacity to accommodate missed exams, late assignments or extensions.

- If you **miss a mid-term test**, you may only write a make-up test if you **inform me before the test** and **provide acceptable supporting documentation within 48h of the missed test**. If required, there will be one date for a make-up test and no make-up test can be written after the test results have been returned to the class. This also applies to students registered with SAS.
- If you miss the final exam, you need to follow the protocol required by Enrolment Services. You can find it in the Calendar: [University Regulations](#) (scroll to Section IV Examinations)

However, if you do run into **time constraints or other difficulties during the semester**, I encourage you to contact me (please use the D2L email for this), and I will work with you to find a solution.

## Accommodation for Disabilities

Lakehead University is committed to achieving full accessibility for persons with disabilities. Part of this commitment includes arranging academic accommodations for students with disabilities and/or medical conditions to ensure they have an equitable opportunity to participate in all of their academic activities. If you are a student with a disability and think you may need accommodations, you are strongly encouraged to contact Student Accessibility Services (SAS) and register as early as possible. For more information, please contact [Student Accessibility Services](#) (SC0003, 343-8047 or [sas@lakeheadu.ca](mailto:sas@lakeheadu.ca))

## Academic Integrity

A breach of Academic Integrity is a serious offence. The principle of Academic Integrity, particularly of doing one's own work, documenting properly (including use of quotation marks, appropriate paraphrasing and referencing/citation), collaborating appropriately, and avoiding misrepresentation, is a core principle in university study. Students are strongly advised to familiarize themselves with the Student Code of Conduct - Academic Integrity ("[The Code](#)") - and, in particular, **sections 26 and 83 through 85**.

Non-compliance with the Code will NOT be tolerated in this course and the Code will be adhered to in terms of disciplinary action. The Code provides a full description of academic offences, procedures when Academic Integrity breaches are suspected and sanctions for breaches of Academic Integrity.

To help all students in the class understand application of Academic Integrity to course work, everyone will be required to complete the [Academic Integrity Matters \(AIM\) course](#) or the AIM Refresher Module and submit the Certificate of Completion to the Assignment Folder in D2L.

I will not grade any of your work unless you have submitted the Certificate.

## Notice regarding Copyright

Students should be aware that all instructional, reference, and administrative materials prepared for this course are protected in their entirety by copyright. Students are expected to comply with this copyright by only accessing and using the course materials for personal educational use related to the course, and that the materials cannot be shared in any way, without the written authorization of the course instructor. If this copyright is infringed in any way, students may be prosecuted under the Lakehead University Student Code of Conduct – Academic Integrity, which requires students to act ethically and with integrity in academic matters and to demonstrate behaviors that support the University's academic values.

### **All students accessing materials of APBI/BIOL-3135 must agree to the following Copyright Compliance:**

I understand and agree that all instructional, reference, and administrative materials to which I am given access in this course (the "course materials"), whether they consist of text, still or kinetic images, or sound, whether they are in digital or hard copy formats, and in whatever media they are offered, are protected in their entirety by copyright, and that to comply with this copyright and the law.

(a) I may access and download the course materials only for my own personal and non-commercial use for this course; and

(b) I am not permitted to download, copy, store (in any medium), forward or share, transmit, broadcast, show, post or play in public, adapt, or change in any way any text, image, or sound component of the course materials for any other purpose whatsoever except as expressly authorized, and only to the extent authorized, in writing, by the course instructor.

I further understand and agree that, if I infringe the copyright of the course materials in any way, I may be prosecuted under the Lakehead University Student Code of Conduct – Academic Integrity, which requires students to act ethically and with integrity in academic matters and to demonstrate behaviours that support the University's academic values.

## Notice for Recording Lectures and Class Activities

In APBI/BIOL-3135 instruction in the classroom may be recorded for confidential access by students registered in the course but who are unable to attend class due to the pandemic or other necessity. To the greatest extent possible only the image and voice of the instructor will be recorded for this purpose but, due to class interaction, the images and voices of students present in the classroom may be incidentally recorded and, thus, be available for access by course students in remote locations. These recordings, however, are strictly confidential and may be used only by the instructor and students registered in the course and only for purposes related to the course. They may otherwise not be used or disclosed. Students in the classroom who are concerned about being recorded in this fashion may request the instructor to exclude them from the recording to the greatest degree possible on the understanding that total exclusion cannot be guaranteed. The recordings are made under the authority of sections 3 and 14 of The Lakehead University Act, 1965. Questions about the collection of the images and sounds in the recordings may be directed to the Chair of Biology (Dr. A. Mallik, email [amallik@lakeheadu.ca](mailto:amallik@lakeheadu.ca), telephone 807-343-8927).

**Lecture Schedule – APBI/BIOL 3135 Fall 2022**

<b>Week</b>	<b>Date</b>	<b>Topic</b>	<b>Important Dates</b>
<b>1</b>	Sept. 5 - 11	The bacterial chromosome and bacterial gene expression: Chapters 1 & 2	
<b>2</b>	Sept. 12 - 18		<i>Sept. 19: Last day to add</i>
<b>3</b>	Sept. 19 - 25	Bacterial genetic analysis: Chapter 3	<b>Sept 20:</b> from this day onwards, iClicker submissions will count towards the final grade
<b>4</b>	Sept. 26 – Oct. 2	Plasmids: Chapter 4	
<b>5</b>	Oct. 3 - 9	Conjugation, Transformation and Transduction: Chapters 5, 6, and 7	<b>Tue Oct. 4: Test #1</b>
	Oct. 10 - 16	<b>STUDY WEEK</b>	
<b>6</b>	Oct. 17 - 23	Conjugation, Transformation and Transduction: Chapters 5, 6, and 7	
<b>7</b>	Oct. 24 - 30	Transposition and site-specific recombination: Chapter 8	
<b>8</b>	Oct. 31 – Nov. 6	Homologous recombination: Chapter 9	<i>Nov. 4: Last day to drop</i>
<b>9</b>	Nov. 7 - 13	DNA repair and mutagenesis: Chapter 10	<b>Thu Nov. 10: Test # 2</b>
<b>10</b>	Nov. 14 - 20	Regulation of gene expression – genes, operons, regulons and stimulons: Chapters 11 & 12	
<b>11</b>	Nov. 21 - 27		
<b>12</b>	Nov. 28 – Dec. 5		

**Laboratory Schedule – APBI/BIOL 3135 Fall 2022**

<b>Date</b>	<b>Experiments and Lab Manual Reference</b>	<b>Tests and Materials Due</b>
Sept 8	Lab Overview, Lab Safety and Gel Doc Training	
Sept 15	DNA Extraction and Initial PCR (Ch. 1 & 2)	Pre-Lab Quiz Focus Questions (Ch. 1)
Sept 22	Nested PCR (Ch. 2) Prepare Broth and Plates for Transformation (App. A)	Pre-Lab Quiz
Sept 29	Pour Agarose Gels (App. A) Electrophoresis and Purification of PCR Products (Ch. 3 & 4)	Pre-Lab Quiz Focus Questions (Ch. 2, 3, 4)
Oct 6	Ligation and Transformation (Ch. 5 & 6)	Pre-Lab Quiz Focus Questions (Ch. 5 & 6)
Oct 20	Plasmid Purification (Ch. 7) Pour Agarose Gels (App. A)	Pre-Lab Quiz Focus Questions (Ch. 7)
Oct 27	Gel Electrophoresis of Plasmid Purification (Ch. 7) Prepare Sequencing Reactions (Ch. 8)	Pre-Lab Quiz Focus Questions (Ch. 8)
Nov 3	No Lab: Wait for Sequencing Results	
Nov 10	No Lab: Wait for Sequencing Results	
Nov 17	Bioinformatics of Sequence Data (Ch. 9)	Pre-Lab Quiz Focus Questions (Ch. 9)
Nov 24	No Lab	

**Breakdown of Laboratory Grade (worth 30% of course grade)**

<b>Description</b>	<b>Value</b>
Pre-Lab Quizzes	5.6%
Focus Questions	7.1%
Lab Assignments	10.3%
Lab Notebook	6%
Laboratory Performance and Preparedness	1%



## iClicker – Steps for Registration

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In order to participate in my iClicker activities and ensure that your grades are properly reflected in the grade book, please follow the steps below:

### 1. If you do not already have an iClicker account, [create one](#). It's free to create an account!

- You can do this by downloading and opening the iClicker student mobile app via the App Store or Google Play, or by visiting [iclicker.com](http://iclicker.com) and creating an account as a student.
- **If you already have an account, DO NOT create a new one. You can only receive credit from one account.**
- When creating your iClicker account, make sure to **use your lakeheadu email**.
- Enter your name and email exactly as they appear in D2L account/Lakehead University student account.
- **IMPORTANT: In the "Student ID field", add the username of your lakeheadu email (the name before @lakeheadu.ca)**

### 2. Add my iClicker course to your iClicker account

- Log in to your iClicker account and use the + sign to search for my course.
- In the "Find Your Institution" field, enter **Lakehead University – Thunder Bay**
- In the "Find Your Course" field, enter **APBI/BIOL-3135 Molecular Genetics**
- Double-check the details you see to make sure you select this course:
  - APBI/BIOL 3135 FA
  - Heidi Schraft
  - Fall 2022
  - Meeting times: Tue, Thu: 8:30 am
- Select "Add This Course" and it will be added to the main Courses screen of your iClicker account.
  - You can also use this join code: <https://join.iclicker.com/Q8YL7>

**3. Purchase an iClicker subscription or access code, or use an iClicker remote to participate in class.**

- You may have an iClicker subscription from another course
- Upon signing up with iClicker, you will have a two-week free-trial period for using the app to participate in class activities. **Before the free trial ends**, you need to [purchase an iClicker subscription or obtain an access code](#) to continue participating in class with iClicker on your mobile device, tablet, or laptop. To [redeem an access code](#), you must visit the **Subscriptions** section of [the iClicker student web app](#) (**NOT** the mobile app). iClicker will let you know when your free trial is ending. If your free trial ends without completing this step, you will be unable to participate in class activities until you purchase a subscription or enter an access code.

**4. Set up the device you'll use to participate in my class sessions.**

- You can download the iClicker student mobile app via the App Store or Google Play, or you can use the iClicker web app by signing in as a student at [iclicker.com](https://iclicker.com).
- Connect to our classroom's Wi-Fi:
  - The wireless network you should use in our classroom is the Lakehead University Wifi. Alternatively, you can use the TBayTel Wifi.
- In order to use an iClicker remote in my class, just make sure you [add your iClicker remote ID number to the profile section of your iClicker account](#). Remember to bring your voting device with you to every class!

**5. Now the fun part! Participate in my class activities.**

- When it's time for class, make sure you have selected my course from the main screen of your iClicker account.
  - When I start a session, select the **Join** button that appears on your screen, then answer each question I ask in iClicker.
  - For short answer, numeric, and target questions, make sure you select **Send**.

**6. Keep track of your attendance, review your work, and study after class in iClicker.**

- You can review your grades, performance, and participation in iClicker.
- You can bookmark the questions I asked during class to turn them into flashcards or practice tests in the [Study Tools section of iClicker](#).

**Academic Integrity Information**

iClicker activities fall under the provisions of our campus academic integrity code. Students must not engage in academic dishonesty while participating in iClicker activities. This includes but is not limited to:

- Checking in while not physically in class (except for ZOOM classes)
- Having another student check you into class
- Answering polling questions while not physically in class
- Looking at other students' devices while answering live questions. Using more than one iClicker device or account at a time

Any student found to be in violation of these rules will lose their iClicker points for the entire term and may be reported to the Office of Student Conduct.

**Need help with the iClicker student app** If you are having trouble with your iClicker access code, check out this [guide to access code errors](#).

- If you are having issues connecting to the iClicker student app, check out these [iClicker Connectivity Tips](#).
- If you are having issues seeing your iClicker points, check out this [troubleshooting guide](#).
- Find answers to many of your questions and contact the iClicker Tech Support Team by visiting [iclicker.com/support](https://iclicker.com/support) at any time.