

BIOL 465 (CRN 10423 - A01)

The Molecular Biology of Cancer

Fall 2026

Tues/Wed/Fri 8:30 pm - 9:20 pm
Location: David Turpin Building DTB: A104

Lecture: David Turpin Building DTB: A104; Tues/Wed/Fri 8:30 pm - 9:20 pm
Lectures will be in class.

Office Hrs.: Cunningham 217 or on Zoom. Tues. 11:30 - 12:30 pm, or at another arranged time
(please email beforehand with BIOL 465 as the subject).

Instructors: Dr. Patrick Walter
Dr. Julian Lum

Email: pwalter@uvic.ca
Email: JLum@bccancer.bc.ca

Intended Learning Outcomes:

This introductory molecular course covers fundamental topics in cancer biology, including the key hallmarks of cancer. Following this course, you should be able to understand and describe important aspects of several oncogene signal transduction pathways, tumour suppressor proteins, different types of cell death, and immune system pathways (including growth pathways, cancer metabolism, hormone-driven cancers, and the role of certain environmental conditions). You should be able to demonstrate a grasp of the molecular consequences of sporadic and/or germline mutations, how they disrupt or deregulate key pathways, and the pathologies behind some more common cancers. You should also have a working understanding of:

- Oncogene signalling pathways, tumour suppressor pathways and key aspects of the immune system.
- Cancer cell metabolism, and the cells involved in the tumour microenvironment.
- The molecular basis for hormones in driving some cancers.
- How stem cells and chemoresistance contribute to the poor prognosis of certain cancers.

In addition, you should be able to critically interpret scientific literature related to cancer biology.

Description:

This course will cover molecular events that lead to cancer. The course will be divided into sections structured around first understanding important signal transduction pathways in cancer and then discussing some of the major types of cancer, including leukemia, breast, and CLL. Special emphasis will be placed on understanding the signal transduction pathways that drive tumorigenesis at each site, particularly the roles of tumour suppressors and oncogenes. The course will consist of formal lectures, assigned journal article readings from the current literature, discussions, and class questions using Brightspace. The goal of reading journal articles, participating in discussions, and answering questions will be to create an interactive environment that introduces students to the role of scientific discovery in developing ideas for understanding cancer mechanisms and treatments. The use of genetic tools such as transgenic and knockout mouse models to dissect oncogenic pathways will be examined, and experimental design will be discussed. You are expected to have familiarity with cell biology and cell signalling – i.e., have taken Biology 360, OR either of Bioc 300a or Bioc 300b. If you wish to review molecular aspects of cancer, Dr. Robert A. Weinberg's "The Biology of Cancer" (Garland Science, ISBN 9780815342205) is an excellent textbook. This is **NOT** a required text, but it is a useful reference if you feel you lack background material or if you simply learn better from textbooks.

Description from the UVic Calendar:

Units: 1.5, Hours: 3-0

Clinical terminology, concepts of cancer epidemiology, DNA mutation and repair, molecular basis of cell cycle regulation, cell proliferation and apoptosis. Special emphasis on chemotherapy, gene therapy, diet and cancer, and the immunology of cancer

Prerequisites: BIOL 225, 230, AND 1 of the following: BIOL 360 OR either of BIOC 300a or 300b

Office Hours (please send an email with BIOL 465 in the subject):

Online or in Cunn 217 11:30 – 12:30 Tuesdays or Fridays (by appointment). The instructor who teaches the lecture that follows will be present. Dr. Walter is adjunct faculty and therefore has limited time on campus, and Dr. Lum is not on campus except for this course. If these times conflict with your schedule, e-mail to set up an alternative time to meet.

Brightspace:

This course uses the university Brightspace learning/teaching resource. To access this Course, use your Netlink ID and password and log on to Brightspace from <https://www.uvic.ca/> OR directly: <https://bright.uvic.ca/d2l/home/485783>

We will post the course notes outline, journal article guidelines and other important information through this site. We will also post the PowerPoint presentation (in PDF format) for each lecture prior to each class. You may choose to print the slides and add notes to them during class. Please check Brightspace regularly, as course announcements will be posted there.

We will also use BrightSpace for in-class questions and assigned homework questions. This will be worth 15%. Review questions, discussions of scientific papers, and in-class questions will be posted. 5% bonus grade for answering 70% of the in-class questions.

Optional Course Text:

The Biology of Cancer by Robert A. Weinberg. **This text is recommended / optional and not required.** This text is now available in a digital format and is a great text with extensive clinical information. If you intend to continue studying in the medical field, it would be a good reference to own. We will NOT be covering all the material in the text. The primary source of information will be the lecture slides covered in class online. Copies of the textbook are in the library. There may also be secondhand copies of the text available from the Used Book Store.

Assigned Material and Journal Articles:

Because there is no assigned text for the course, topics will be drawn from primary and review articles in the scientific literature, which will be assigned during class, and links will be posted on Brightspace. Lecture time will be allocated to reviewing the papers as part of the class discussion. Reading assignments are mandatory and will be included in the evaluation (i.e. on the midterm and final exams). In addition, when readings are assigned for a discussion lecture, students must come prepared to discuss the paper and have read the assigned reading. Students are also expected to attend the lectures, take notes, and participate in discussions. Questions will be asked during class using Brightspace throughout the term. Questions on each journal article will be tested on the midterm and final exam. See below for details regarding the journal articles. These journal article discussion questions will be posted on Brightspace.

Course Evaluation:

32% Midterm (Required) – Tuesday, Oct. 27 (50 min in class (Face to Face). Cumulative, includes journal articles and will be short answer or multiple choice. If you miss the midterm due to a medical excuse, you will take a makeup exam on a scheduled date. If you have special circumstances or need accommodation to participate in the midterm, please notify us (see below).

You must write the midterm exam to receive a final grade for the course.

38% Final exam (Required) - Date TBD (on campus, Face-to-face), Saturday, Dec.10th or thereafter (3 hours, cumulative but builds on the previous section's material). Must be completed to receive a final grade for the course. Deferred exams will be handled as outlined in the University of Victoria calendar.

You must write the midterm exam to receive a final grade for the course.

15% In-Class and Homework Assigned Review Questions on BrightSpace

We will also use BrightSpace for in-class questions and assigned homework questions. This will be worth 15%. These quizzes will include review questions, discussions of scientific papers, and in-class questions. Each class will include at least one question.

5% for Participation in Quizzes: Students will receive 5% for answering $\geq 70\%$ of the questions.

10% - Journal article take-home assignments

We will assign two (2) journal articles and spend some class time discussing them. We will assess your comprehension and critical interpretation of the journal articles and their data through 2 (5% each) take-home assignments containing multiple-choice, fill-in-the-blank, and/or short-answer questions (on Brightspace).

Please monitor the due dates for in-class questions and homework-assigned review questions, and the Journal article assignment; Brightspace will cut off submissions at that time, resulting in a grade of 0% for late submissions. However, students who request to submit a late assignment (in fairness to others who handed it in on time) will receive a 5% penalty per day, with submissions after 3 days receiving a 0.

Students are expected to attend the midterm and final exam on the specified dates. Failure to write the midterm exam as described above will result in a grade of 0% for the exam unless due to illness, accident, or family affliction. Students who miss the midterm exam for one of the legitimate, documented reasons listed (described more below) will write a deferred midterm exam within *approximately* 10 business days of the midterm date.

N grades

Students who have completed the following elements will be considered to have completed the course and will be assigned a final grade: The Midterm and the Final Exam.

Failure to complete one or more of these elements will result in a grade of "N" regardless of the cumulative percentage on other elements of the course. An N is a failing grade and counts as 0 in a student's GPA. The maximum percentage that can accompany an N on a student's transcript is 49.

Therefore, you must write the midterm exam and the final exam to pass the course.

Furthermore, if you have any emergency or any situation (**That may include but not limited to:** illness, mental health and wellness, or lack of access to information; please also see the link below on concessions for more details) that will in any way affect your ability to attend (or have attention to) online classes or exams, please contact me (**there is no need for you to give me any description of your situation**) as soon as possible (email or phone). If it's after the midterm and affects your

ability to complete the course or for the final exam, please download and complete an academic concession form from UVic's website: <https://www.uvic.ca/students/academics/academic-concessions-accommodations/> . Deferral of a final exam must be requested with this Academic Concession form and submitted directly to Undergraduate Records. **Deferred final exams will be arranged by the instructor in the first two weeks of January.** Travel is not an acceptable reason to miss the deferred final exam date.

Your total mark, calculated from the marks on all exams and BrightSpace in-class/assigned questions according to the weighting scheme above, will be converted to a percentage and then to a letter grade (please see the grade information below).

Your final overall mark in the course will be given as a percent and a Letter Grade based on the following guidelines: A+ = 90-100%, A = 85-89.9%, A- = 80-84.9%, B+ = 77-79.9%, B = 73-76.9%, B- = 70-72.9%, C+ = 65-69.9%, C = 60-64.9%, D = 50-59.9%, F = 0-49.9% (if all requirements completed), N (if not all requirements completed). Please see details below.

You are not allowed to cheat or plagiarize in this course, as outlined in the University of Victoria calendar. This course will strive to be an inclusive and safe learning environment that recognizes the diversity of students and their opinions, as outlined in the University calendar.

For questions about lecture material, students should contact the instructor for that topic. General concerns and questions about marks should be addressed to Dr. Walter as course administrator. The UVic Grading Scheme is below (effective May 1, 2012):

Passing Grades	Grade Point Value	Percentage for Instructor Use Only *	Description
A+	9	90 – 100	Exceptional, outstanding and excellent performance. Normally achieved by a minority of students. These grades indicate a student who is self-initiating, exceeds expectation and has an insightful grasp of the subject matter.
A	8	85 – 89	
A-	7	80 – 84	
B+	6	77 – 79	Very good, good and solid performance. Normally achieved by the largest number of students. These grades indicate a good grasp of the subject matter or excellent grasp in one area balanced with satisfactory grasp in the other area.
B	5	73 – 76	
B-	4	70 – 72	
C+	3	65 – 69	Satisfactory, or minimally satisfactory. These grades indicate a satisfactory performance and knowledge of the subject matter.
C	2	60 – 64	

D	1	50 – 59	Marginal Performance. A student receiving this grade demonstrated a superficial grasp of the subject matter.
F	0	0-49	Unsatisfactory performance. Wrote final examination and completed course requirements; no supplemental.
N	0	0-49	Did not write examination or complete course requirements by the end of term or session; no supplemental.

Students are expected to take notes during class, copies of slides will be provided on Brightspace before class, however these notes should not be considered complete, and students are responsible for all material discussed online. Plagiarism and copying are all academic offences and submitted material must be your own work. Students must abide by the UVic academic regulations and observe standards of 'scholarly integrity' (no plagiarism or cheating).

Grading will be based on answering short and long answer exam questions. The exams will test your ability to think and incorporate concepts and ideas, and design experiments. Understanding of material will be tested and memorizing the lecture handouts will not be sufficient. You are expected to have completed 3rd year Cell biology and Biochemistry, and the onus is on you to review pertinent material as needed.

Territory acknowledgement:

All the instructors involved with Biol 465 acknowledge with respect the Lekwungen peoples on whose traditional territory the university stands and the (Songhees and X^wsepsəm/Esquimalt) and W̱SÁNEĆ Peoples on whose territories we live, learn and work and whose historical relationships with the land continue to this day. Please see:

<https://www.uvic.ca/services/indigenous/facultystaff/territory-acknowledgment/index.php>

Support services:

If you need support, campus services can help. Please see any of the following:

Centre for Academic Communication <https://www.uvic.ca/learningandteaching/cac/>

Math-assistance Centre <https://www.uvic.ca/science/math-statistics/current-students/undergraduate/msac/index.php>

Student wellness - Counselling Services <https://www.uvic.ca/students/health-wellness/counselling/index.php>

Student wellness - Health Services <https://www.uvic.ca/student-wellness/index.php>

Library <https://www.uvic.ca/library/>

Ombudsperson <https://www.uvic.ca/universitysecretary/senate/appeals/ombudsperson/index.php>

Computer Help Desk <https://www.uvic.ca/systems/about/academic/helpdesk/index.php>

Spiritual Health/Meditation <https://test.uvic.ca/student-wellness/our-services/spiritual-health/index.php>

Centre for Accessible Learning:

Accessible Learning: The University of Victoria is committed to creating a learning experience that is as accessible as possible. If you anticipate or experience any barriers to learning in this course,

please feel welcome to discuss your concerns with me. If you have a disability or chronic health condition, or think you may have a disability, you may also want to meet with an advisor at the Centre for Accessible Learning (CAL). You can find more information about CAL here:
<https://www.uvic.ca/accessible-learning/index.php>

Online conduct statement:

The University of Victoria is committed to promoting critical academic discourse while providing a respectful and supportive learning environment. All members of the university community have the right to this experience, and the responsibility to help create such an environment. The University will not tolerate racism, sexualized violence, or any form of discrimination, bullying or harassment.

Please be advised that by logging into UVic's learning systems and interacting with online resources, you are engaging in a university activity. All interactions within this environment are subject to the university expectations and policies. Any concerns about student conduct may be reviewed and responded to in accordance with the appropriate university policy. To report concerns about online student conduct: onlineconduct@uvic.ca

Copyright:

Instructors make all course content and materials available for educational purposes and for the exclusive use of students registered in their class. The material is protected under copyright law, even if not marked with a ©. Any further use or distribution of materials to others requires the written permission of the instructor, except under fair dealing or another exception in the Copyright Act. Violations may result in disciplinary action under the Resolution of Non-Academic Misconduct Allegations policy (AC1300).

The use of artificial intelligence (AI) and academic integrity:

Unacceptable use of AI:

Using any form of AI during invigilated quizzes, exams, and other assessments is unethical and violates academic integrity unless the instructor has specifically given permission. Recording quiz, exam, or assignment questions and sharing them with peers who missed the evaluation and must defer violates academic integrity.

Acceptable use of AI:

AI can be very useful when students use it as a study tool: it is okay to write your own summary and ask AI to generate exam questions. It is NOT okay to copy and paste lecture slide content directly into AI, as this would violate copyright.

Provisional Lecture Schedule 2026 (Changes will be necessary)

Week 1: SEMESTER STARTS Wed Sept. 9 ENDS Wed Dec. 7 2026

1. Wed Sept 9. Introductions/Outline/Cancer Overview – Walter.
2. Fri Sept 11. Introduction to concepts, terms, and overview of Cancer, defining the hallmarks – Walter

Week 2:

3. Tues Sept 15. Hallmarks of cancer – 1st hallmark – self-sufficiency in growth factors - Walter
4. Wed Sept 16. Oncogenes & tumor suppressors how they relate to the hallmarks of cancer – Walter
5. Fri Sept 18. Self-sufficiency in growth signals, HER2 / EGF - Walter

Week 3:

- Mon. Sept 22. **Last day for 100% reduction of tuition fees for first term and full year courses**
6. Tues Sept 22. The Hallmarks of Cancer - Oncogenes, RTK & Ras – Walter
 7. Wed Sept 23. Ras and Insensitivity to Antigrowth Signals – Walter
 8. Fri Sept 25. Vitamin D, the immune system and cancer – Walter
- Fri Sept 25. Last day for adding courses that begin in the first term**

Week 4:

9. Tues Sept 29. Vitamin D and Cancer – Walter – Possible intro to immune system
- Wed. Sept 30. Last day for paying first term fees without penalty**
- Wed. Sept 30. National Day for Truth and Reconciliation, UVic closed.**
10. Fri Oct 2. Vitamin D, the immune system, Immunoediting in Cancer – Walter

Week 5:

11. Tues. Oct 6. T-cell infiltration and favourable prognosis, Evasion of apoptosis in Cancer – Walter
12. Wed Oct 7. Evasion of apoptosis and ferroptosis in Cancer, p53 – Walter
13. Fri Oct 9. P53, Bcl-2 proteins – Walter

Week 6:

- Monday Oct. 12. Thanksgiving Day**
- Tues Oct 13th Last Day for 50% reduction of tuition fees for standard courses**
14. Tues Oct 13. Senescence and inflammation, Cell-cell interaction – Walter
 15. Wed Oct 14. Inflammation and ECM. – Walter
 16. Fri Oct 16. DNA repair, tumour metabolism, and the immune system in cancer. The immune system and cancer – Walter

Week 7

17. Tues Oct 20. DNA repair, tumour metabolism and the immune system in cancer - Walter
18. Wed Oct 21. Hypoxia and tumour metabolism, TME and chronic inflammation – Walter
19. Fri Oct 23. Immune system and cancer AND Review / Practice midterm – Walter

Week 8:

- 20. Tues Oct 27 Midterm 32% - Walter**
21. Wed Oct 28. Cancer and the immune system - Walter
 22. Fri Oct 30. Finish immune system - TAMs and breast cancer - Reading Assignment 1 – Walter
- Sat Oct 31. Last Day to Drop Courses without Failure**

Week 9:

23. Tues Nov 3. TAMs and Breast cancer - Reading Assignment 1 - Walter
24. Wed Nov 4. TAMs in CLL. Breast cancer and LAN – Walter
25. Fri Nov 6. DNA damage and cancer – Walter

Week 10:

- Mon, Nov. 10 – Wed 12: Reading break. No classes**
- Tues Nov 11, Remembrance Day. University closed Mon Nov. 11**

26. Fri Nov 13. DNA damage and cancer. Tumour metabolism in cancer – Walter

Week 11:

27. Tues Nov 17. Inherited Cancers – Lum

28. Wed Nov 18. Synthetic Lethality – Lum

29. Fri Nov 20. Angiogenesis – Lum

Week 12:

30. Tues Nov 24. Autophagy – Lum

31. Wed Nov 25. Cell Engineering & Cancer Immunotherapy – Lum

32. Fri Nov 27. Diet and the gut microbiome in cancer – Lum

Week 13:

33. Tues Dec 1. Cancer Clinical Trials - Lum

34. Wed Dec 2. Biomarkers and Molecular Pathology of Breast Cancer – Peter Watson

35. Fri Dec 4. Tumour metabolism in cancer – Walter

Week 14:

Mon Dec 7. Last day of classes

Mon Dec. 7 National Day of Remembrance and Action on Violence Against Women. Classes cancelled from 11:30 am to 12:30 pm.

FINAL EXAM TBA