

Chemistry 564 - Receptor Biochemistry and Protein Modifications

SDSU Spring Semester 2025

Course Information:

Class days: Monday and Wednesday
Class times: 10:00-10:50 am
Class location: GMCS 314
Mode of delivery: In person Lecture/Discussion
2 credits, Section 01, (or Zoom if conditions and policy change)
Class Schedule # 3222

Instructor: Dr.K. (David Kretchmar, PhD.)
Phone: 217.622.1901
Email: dkretchmar@sdsu.edu
Office: Love Library Room 328 (MSLC – 3rd floor Love Library)
Office hours: MW ≈ 1-3pm, F ≈ 10-11:30am, or by appointment

Learning Objectives:

- Describe various types of lipids and membrane proteins.
- Describe how proteins, lipids and carbohydrates are involved in signal transduction.
- Discuss and describe the importance of signal transduction, the need for communication between cells in multi-cellular organisms, sensing the environment, and role of receptors in sensing and communication.
- Discuss and describe the biochemical mechanisms of taste, touch, smell, sight, sound, temperature, etc.
- Detail the signal transduction cascades of various membrane and cytosolic receptors.
- Discuss receptor-mediated endocytosis.
- Discuss regulated intramembrane proteolysis.

Prerequisites: CHEM365 or CHEM560:

Amino acids	structures and basic chemical properties
Nucleotides	structures, names and chemical properties
Proteins	primary, secondary, and tertiary structure; forces involved in protein folding, basic understanding of enzyme-mediated catalysis
Lipids	structure and function of common lipids
Membranes	function and physical properties, types of membrane proteins, synthesis of type 1 integral membrane proteins
Cell biology	basic organization and compartmentalization of the cell

Course materials:

- Simple Scientific Calculator with log/antilog (non-graphing)
- Computer with videoconference compatibility (Zoom or Conferences thru canvas)
- We will use handouts and PowerPoint lectures that will be posted on Canvas.
(Handouts are copies of articles from the scientific literature).

You may find useful information in Principles of Biochemistry (Lehninger), the 6th edition is sufficient (and available as a free PDF online). Signal transduction (Gomperts, Kramer and Tatham) is a book completely devoted to signal transduction. Molecular Biology of the Cell by Alberts, et al. has a few good chapters on receptors.

Important Dates: <https://registrar.sdsu.edu/calendars/academic/spring-2025>

Wed. Jan. 22, 1st day of class; Thurs. Jan. 30 - Last day for faculty to drop students from classes (11:59 p.m. deadline); Mon. Feb. 3rd - Last day to officially withdraw without penalty fee. Last day for students to add, drop, or change grading basis (11:59 p.m. deadline). Last day for faculty to add from their wait list.

If conditions warrant...all class activity will be taught on-line via zoom (Please have available a computer with videoconference compatibility at the ready)

Grading Policy and Scale:

Grades will be based on exams, quizzes, term paper, homework and participation as follows:

<u>Activity</u>	<u>Points</u>	<u>≈ % of Total</u>
Exams (2 @ 50 pts + Final @ 100 pts)	200	33.33
Term paper	150	25.00
Quizzes/Discussions (best 10 @ 20 pts each)	200	33.33
Homework/other	40	6.67
Participation	<u>10</u>	<u>1.67</u>
Total	600	100.00

The following grading scale will be applied to all work:

<u>Letter Grade</u>	<u>Points</u>
A	558 - 600
A-	540 - 557
B+	522 - 539
B	498 - 521
B-	488 - 497
C+	462 - 487
C	438 - 461
C-	420 - 437
D+	402 - 419
D	378 - 401
D-	360 - 377
F	< 359

Exams: There will be two (2) unit tests given approximately the 5th, and 10th week of the semester, and a comprehensive final. Exams may include multiple choice, short answers, matching, true/false, calculations and **essay questions**. The tests will be given in class or on-line. Any changes to the projected test dates will be announced in class. You are expected to be present when a test is given, **No make-up exams will be given without prior arrangement**. A comprehensive final exam will cover the entire semester and will be given during finals week. **This test must be taken on the date scheduled. NO EXCEPTIONS.** Everyone must take the final. **Exams and Conflicts:** If you have an exam conflict, you must inform the instructor **at least ONE WEEK** in advance to arrange an alternate exam. No late exams will be given.

Quizzes; may be given at least once per week during the semester (**some will be unannounced**). Quizzes will be given on-line or during class and will have a time limit during a given time window. **Missed Quizzes:** No make-up quizzes will be allowed without prior arrangement with the instructor.

Abstract, Updates and Term paper: A **long** term paper project for the semester, involving a topic of your choosing involving receptors/receptor pathways/receptor mechanisms.

The minimum requirements to pass this course are: **Your average Exam and Quiz score must be at least 60% for the two exams, final exam and 10 quizzes**, If you do not meet the minimum requirements, you will receive a grade of F regardless of your total points.

Any homework assignment not turned in will be deducted from your final grade!!!

University policies:

Accommodations: Students Ability Success Services: If you are a student with a disability and are in need of accommodations for this class, please contact Student Ability Success Center at (619) 594-6473 as soon as possible. To avoid any delay in the receipt of your accommodations, you should contact Student Disability Services as soon as possible. Please know accommodations are not retroactive, and I cannot provide accommodations based upon disability until I have received an accommodation letter from Student Ability Success Center. Your cooperation is appreciated and to your benefit.

<https://sites.google.com/sdsu.edu/sasconnect/home>

Religious Observances: The University Policy File includes the following statement on Absence for Religious Observances: By the end of the second week of classes, students should notify the instructors of affected courses of planned absences for religious observances. Therefore, if you foresee that the date of a religious observance coincides with an exam date, please see me before the end of the second week of the semester. Do not wait, no make-up exam requests will be granted within 5 business days, either before or after an exam date.

Academic Honesty: The University adheres to a strict [policy prohibiting cheating and plagiarism](#). Examples of academic dishonesty include but are not limited to:

- copying, in part or in whole, from another's test or other examination;
- obtaining copies of a test, an examination, or other course material without the permission of the instructor;
- collaborating with another or others in work to be presented without the permission of the instructor;
- falsifying records, laboratory work, or other course data;
- submitting work previously presented in another course, if contrary to the rules of the course;
- altering or interfering with grading procedures;
- assisting another student in any of the above;
- using sources verbatim or paraphrasing without giving proper attribution (this can include phrases, sentences, paragraphs and/or pages of work);
- copying and pasting work from an online or offline source directly and calling it your own;
- using information you find from an online or offline source without giving the author credit;
- replacing words or phrases from another source and inserting your own words or phrases.

The California State University system requires instructors to report all instances of academic misconduct to the Center for Student Rights and Responsibilities. Academic dishonesty will result in disciplinary review by the University and may lead to probation, suspension, or expulsion. Instructors may also, at their discretion, penalize student grades on any assignment or assessment discovered to have been produced in an academically dishonest manner. Students will receive a zero on the assignment in question, in accordance with the SDSU academic integrity policy. A second instance of academic dishonesty will result in failure of the course and possible expulsion from the university.

Campus Safety: To be prepared for emergencies, each student is responsible for becoming familiar with the evacuation plan specific to each classroom. The evacuation plan is posted within each classroom and should be examined on the first day of class. Campus police can be reached by dialing (619) 594-1991 or call 911 in the event of an emergency.

Student Privacy and Intellectual Property: The [Family Educational Rights and Privacy Act](#) (FERPA) mandates the protection of student information, including contact information, grades, and graded assignments. Canvas and SDSU e-mail will be used to communicate with you. Students will be notified at the time of an assignment if copies of student work will be retained beyond the end of the semester or used as examples for future students or the wider public. Students maintain intellectual property rights to work products they create as part of this course unless they are formally notified otherwise.

Resources for students: A complete list of all academic support services--including [Writing Center](#) and [Math Learning Center](#)--is available on the Student Affairs' [Academic Success](#) website. [Counseling and Psychological Services](#) (619-594-5220) offers confidential counseling services by licensed therapists; you can Live Chat with a counselor at http://go.sdsu.edu/student_affairs/cps/therapist-consultation.aspx between 4:00pm and 10:00pm, or call San Diego Access and Crisis 24-hour Hotline at (888) 724-7240.

Classroom Conduct Standards: SDSU students are expected to abide by the terms of the Student Conduct Code in classrooms and other instructional settings. Prohibited conduct includes:

- Willful, material and substantial disruption or obstruction of a university-related activity, or any on-campus activity.
- Participating in an activity that substantially and materially disrupts the normal operations of the University or infringes on the rights of members of the University community.
- Unauthorized recording, dissemination, or publication (including on websites or social media) of lectures or other course materials.
- Conduct that threatens or endangers the health or safety of any person within or related to the University community, including
 1. physical abuse, threats, intimidation, or harassment.
 2. sexual misconduct.

Violation of these standards will result in referral to appropriate campus authorities.

Medical-related absences: Students are instructed to contact their professor/instructor/coach in the event they need to miss class, etc. due to an illness, injury or emergency. All decisions about the impact of an absence, as well as any arrangements for making up work, rest with the instructors. [Student Health Services](#) (SHS) does not provide medical excuses for short-term absences due to illness or injury. When a medical-related absence persists beyond five days, SHS will work with students to provide appropriate documentation. When a student is hospitalized or has a serious, ongoing illness or injury, SHS will, at the student's request and with the student's consent, communicate with the student's instructors via the Vice President for Student Affairs and may communicate with the student's Assistant Dean and/or the [Student Ability Success Center](#).

Counseling and Psychological Services: <https://sacd.sdsu.edu/cps> offers confidential counseling services by licensed therapists. Students can talk with a therapist by calling (619) 594-5220 between 4:00pm and 4:00pm. For after-hours services, students can call the San Diego Access and Crisis Line 24-hours a day at (888) 724-7240.

SDSU Economic Crisis Response Team: If you or a friend are experiencing food or housing insecurity, or any unforeseen financial crisis, visit sdsu.edu/ecrt, email ecrt@sdsu.edu, or walk-in to Well-being & Health Promotion on the 3rd floor of Calpulli Center.

Email Policy: Per University Senate policy, *students are responsible for checking their official university email once per day during the academic term*. For more information, please see [Student Official Email Address Use Policy here](#). All communication regarding this course should occur through official SDSU email accounts. The course instructor will be available via email to answer questions or to schedule office hour appointments. Please allow at least 24 hours for a response, longer over weekends and holidays. To ensure a prompt response include CHEM564 in the subject line of your emails and make sure to provide your full name.

Preferred Names & Pronouns: Any student who wishes to be addressed by a name other than what is presented in Canvas is encouraged to contact the instructor with the name you wish to use. Similarly, if you have preferred pronouns that you wish to be addressed by please contact the instructor.

Land Acknowledgement: For millennia, the Kumeyaay people have been a part of this land. This land has nourished, healed, protected and embraced them for many generations in a relationship of balance and harmony. As members of the San Diego State University community, we acknowledge this legacy. We promote this balance and harmony. We find inspiration from this land, the land of the Kumeyaay.

Syllabus Policy: The instructors reserve the right to change any portion of the syllabus at any time that is deemed necessary to best serve the educational interests of the students in this class, based on the timeline of the class, feedback from students and logistical issues. Changes will not be frequent, and all changes will be announced during a lecture or on Canvas (**may only be announced once**). This means that class attendance in lecture and **checking SDSU email and Canvas** is essential to fully understand the expectations of the course.

Tentative Class Schedule (Emphasis on the word “tentative”)

Week	Date	Lecture	Topic(s)
1	1/22	1	Introduction...receptors???...know your amino acids!
2	1/27	2	Lipids, Carbohydrates, Proteins and Membranes...(review?)
	1/29	3	Integral and lipid-linked membrane proteins and domains
3	2/3	4	Endorphin and Opioid receptors...what a rush!!! Secretory pathways...how fast can you actually think?
	2/5	5	Auditory and Photo receptors...can you hear me or see me?
4	2/10	6	Olfactory receptors...something smells bad!
	2/12	7	Taste and Chemotactile receptors...are you going to eat that?
5	2/17	8	Touch and Thermoreceptor...chilling to the touch!
	2/19		EXAM #1 – Online or In-class
6	2/24	9	Electron receptors...In us... What???
	2/26	10	Ligand binding Receptors...don't let go! G-protein coupled receptors...part of the pathway
7	3/3	11	G-protein coupled receptors...more of the pathway.
	3/5	12	G-protein coupled receptors...and even more of the pathway.
8	3/10	13	GPCR activation, Cyclic AMP a second messenger
	3/12	14	Inositol triphosphate pathway & Phosphate receptors
9	3/17	15	Human Cell receptors and diseases...WTF (wow that's fantastic)!!!
	3/19	16	Glut-1 and Glut-2 receptors & Insulin receptor pathway
10	3/24	17	Glucagon receptor pathway and amplification signals
	3/26		EXAM #2 – In-class on paper
11	3/31		Spring Break
	4/2		Spring Break
12	4/7	18	RTK receptors and pathways
	4/9	19	Receptor-mediated endocytosis
13	4/14	20	LDL, IDL, HDL receptors
	4/16	21	Regulated intramembrane proteolysis
14	4/21	22	Chylomicrons and cholesterol transport and binding
	4/23	23	Details of receptors in muscle contraction
15	4/28	24	Ryanodine Receptors: Structure, Expression, Molecular Details, and Function in Calcium Release and Calmodulin
	4/30	25	Details of muscle contraction and force generation
16	5/5	26	What is an MAB drug? / What is your favorite poisonous animal?
	5/7	27	Open topic/study day...TBD
	5/9		FINAL EXAM - Fri., May 9, 10:30 am - 12:30 pm - Online or In-class

Fold and cut on the dotted line and turn in the contract listed below: (scan or picture or bring to class) Email to: dkretchmar@sdsu.edu

I have read this syllabus (CHEM564 - Spring 2025) and understand the content.

Printed Name: _____ Date: _____

Signature: _____ Section 01, Schedule # 3222