

Syllabus of Chem 3400

Structure and Reactivity of Biomolecules

Class time: Monday, Wednesday, and Friday, 3:30 - 4:20 pm.

Classroom location: Classroom South 600.

Textbook: Organic Chemistry by John McMurry, 9th edition.

Instructor: Professor Jun Yin

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Office hours: Monday 4:30 – 5:30 pm, Office: NSC 571, or by appointment.

Exams

There are three midterm exams and one final exam. One midterm exam of the lowest score will be dropped for calculating the final score of the course. There are no makeup exams. Exams are closed-book and closed-note. Only pens or pencils are allowed for the exams. Midterm exams are of 50 minutes long. The final exam is of 120 minutes long.

Learning outcomes and the objectives of the course

The course is to teach students basic structure and function of biological molecules including carbohydrates, amino acids, peptides, proteins, lipids, and nucleic acids. The course will use organic chemistry as the general language to describe the reactivity of biomolecules and use arrow-pushing mechanisms to illustrate the transformation of biomolecules in the cell. By completing this course, the student will develop a mechanistic understanding of the biochemical reactions that is the knowledge base for advanced courses in biochemistry, molecular and cell biology, immunology, and neurobiology.

Prerequisites of the course

Two semesters of Organic Chemistry 2400 and 2410 with an average grade of C or better. Students do not meet these requirements should ask the instructor for preapproval.

Format of the course

Most the course time is used for lectures and in-class discussions with the students. The students need to read the textbook, attend the lectures, and do the home works. Preview, review, and practice are the keys to a good performance in the course. Students are encouraged to come to the office hour to ask instructor questions about the materials and get advice on how to learn the material.

Lecture schedule

Dates of the exams may be changed. The instructor will announce the exact dates of the exams based on the progress of the lectures.

Week	Date	Chapter	Lecture materials
1	8/20		How to study Review – acid, base, and electronegativity
	8/22		Review – aromaticity, conjugation, stereochemistry
	8/24		Review – functional group, nucleophiles and electrophiles
2	8/27		Review – reactions, substitution, addition, elimination, oxidation, and reduction
	8/29		Review – reaction mechanism, electron-pushing
3	9/5	24	Amine – naming, structures, and basicity
4	9/10	24	Amine – synthesis
	9/12	24	Amine – reactions
	9/14	24	Amine – heterocycles
5	9/17	24	Amine - review
	9/19	25	Carbohydrates – Fisher projections, D/L, aldose, ketose
	9/21		Midterm exam 1 – Chapter 24 Amine
6	9/24	25	Carbohydrates – cyclic structures, anomers
	9/26	25	Carbohydrates - reactions
	9/28	25	Carbohydrates – disaccharides and polysaccharides
7	10/1	25	Carbohydrates - review
	10/3	26	Amino acids – stereochemistry, acidity, and basicity
	10/5	26	Peptides – peptide bond and solid phase peptide synthesis
8	10/8	26	Peptides – solid phase peptide synthesis
	10/10	26	Protein – structure and enzymatic activity
9	10/15	26	Review – amino acids, peptides, and proteins
	10/17	27	Lipids - structures
	10/19		Midterm exam 2 – Chapter 25 and 26
10	10/22	27	Lipids – terpenoids
	10/24	27	Lipids – terpenoids
	10/26	27	Lipids – steroids
11	10/29	28	Nucleic acids – nucleotides, DNA and RNA
	10/31	28	Nucleic acids – DNA sequencing, polymerase chain reaction (PCR)
	11/2	28	Nucleic acids – DNA replication and RNA translation

12	11/5	28	Nucleic acids - review
	11/7	29	Metabolic pathways – fatty acid β -oxidation
	11/9		Midterm exam 3 – lipids and nucleic acids
13	11/12	29	Metabolic pathways – fatty acid β -oxidation
	11/14	29	Metabolic pathways - glycolysis
	11/16	29	Metabolic pathways - glycolysis
14	11/19-23		Thanksgiving, no class
15	11/26	29	Metabolic pathways - glycolysis
	11/28	29	Metabolic pathways – citric acid cycle
	11/30	29	Metabolic pathways – citric acid cycle
16	12/3	29	Metabolic pathways – review
	12/5-10		Final exam – Metabolic pathways