

Chem S101: Chemistry in Context
Summer 2025

Course Description: This course explores the fundamentals of chemistry through real-world applications, beginning with the principles of atoms and molecules and examining how molecular structure determines their function. Topics will range from materials, pharmaceuticals, art, and cooking to laundry detergents. This course aims to encourage students of all backgrounds and academic interests to become knowledgeable, scientifically literate thinkers who approach scientific topics critically and are committed to lifelong learning. This course is intended for non-science majors who have limited to no previous chemistry knowledge. The course is not open to students who have completed another chemistry course at Yale, nor does this course satisfy premedical chemistry requirements or requirements for the chemistry major.

Lectures: M-Th 9:30-11:15 am SCL TBD (in-person, mandatory)

Office hours: M-Th 11:15-12:00pm SCL TBD (or by appointment)

Instructor: Dr. Ruth Son, ruth.son@yale.edu

Attendance: All lectures will be held in person in SCL TBD and feature live demonstrations, in-class problem-solving, and active discussion. Attendance at all lectures is required during the Yale Summer Session.

Absences: Students must inform the instructor *in advance* of any absences.

Grades:

15% **Homework** (6): Problem sets will be due at the beginning of class

50% **Exams** (3): The lowest of 3 exams will be weighted at 10%, the remainder 20% each

35% **Presentation:** Proposal 5%, Update 10%, Final 20%

Student Accessibility Services: Students who require accommodations should work with Student Accessibility Services (sas@yale.edu) and forward their SAS letter to Ruth (ruth.son@yale.edu) by the first day of class.

Academic Honesty: Students are encouraged to collaborate on homework assignments, but each student must submit their own individual work. During exams, students are required to work independently.

Course Materials (optional): No textbooks or materials are required for this course. All necessary resources will be provided on Canvas. The following textbooks are optional and recommended for those who wish to explore topics in more depth:

Organic model kit

Chemistry: The Science in Context (6th ed.) by Gilbert et al.

Chemistry in Context (10th ed.) by The American Chemical Society

Organic Chemistry (7th ed.) by Loudon and Parise

Napoleon's Buttons: 17 molecules that changed history by Couteur and Burreson

Chemistry for Changing Times by Hill and McCreary (open source: [link](#))

Artists' Pigments: A Handbook of Their History and Characteristics by Feller

What Einstein Told His Cook by Wolke

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Schedule (tentative):

L#	Date	Topics	Due
1	(M) 6/30	Introduction to the Course & Chemistry <i>Atoms, elements of the periodic table, electronegativity</i> Activity: Discover elements around SCL	
2	(Tu) 7/1	2D: Chemical Bonds & Molecular Structures <i>Ionic and covalent bonds; Lewis structures; physical properties, olive oil vs. butter</i> Activity: TBD	
3	(W) 7/2	3D: Molecular Geometry & Stereochemistry <i>Enantiomers, chirality, and scents; the story of thalidomide</i> Activity: building models	HW 1 due (L.1-2)
4	(Th) 7/3	Functional Groups, Chemical Reactions, Acids & Bases <i>Functional groups; acids and bases; antacids and heartburn; baking; water-soluble vitamins</i> Activity: red cabbage indicator	Presentation Proposal
5	(M) 7/7	Alkanes, Alkenes, Alkynes <i>Structure & reactivity; climate change; carbocations, terpenes, and steroids</i> Activity: ethylene as a fruit ripener	
6	(Tu) 7/8	Chemistry @ Yale University Art Gallery <i>Meet at YUAG, 1111 Chapel St New Haven</i>	HW 2 due (L.3-5)
7	(W) 7/9	Exam 1 (Lectures 1-5)	
8	(Th) 7/10	Alkenes, Dienes <i>Structure & reactivity; polymers, discovery of Teflon, and recycling; color and dyes</i> Activity: plastic bags vs. Ziploc bags	
9	(M) 7/14	Epoxides, Aromaticity <i>Structure & reactivity; polyaromatic hydrocarbons, nicotine, and cancer</i> Activity: TBD	
10	(Tu) 7/15	Alcohols <i>Structure & reactivity; oxidation reactions, breathalyzers, and biological oxidation of ethanol</i> Activity: TBD	HW 3 due (L.8-9)
11	(W) 7/16	Phenols <i>Structure & reactivity; radical inhibitors, antioxidants, and food additives; acetaminophen</i> Activity: TBD	
12	(Th) 7/17	Alkyl Halides <i>Structure & reactivity; radicals and ozone layer; DDT and pesticides</i>	Presentation Update

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		Activity: TBD	
13	(M) 7/21	Chemistry @ Yale Farm <i>Meet at Yale Farm, 345 Edwards St New Haven</i>	HW 4 due (L.10-12)
14	(Tu) 7/22	Exam 2 (Lectures 8-12)	
15	(W) 7/23	Aldehydes, Ketones <i>Structure & reactivity; reduction reactions; <u>exercise and muscle burn</u>; <u>beta-Carotene in carrots and vision</u></i> Activity: TBD	
16	(Th) 7/24	Carboxylic Acids <i>Structure & reactivity; <u>soap and detergent</u>; <u>decarboxylation, soda and winemaking</u></i> Activity: fermentation balloon experiment	
17	(M) 7/28	Esters, Amides <i>Structure & reactivity; <u>the story of aspirin and opioids</u>; <u>penicillin and antibiotics</u></i> Activity: TBD	HW 5 due (L.15-16)
18	(Tu) 7/29	Amines <i>Structure & reactivity; basicity; <u>food preservatives</u>; <u>airbags</u></i> Activity: TBD	
19	(W) 7/30	Final Presentations	HW 6 due (L.17-18)
20	(Th) 7/31	Exam 3 (Lectures 15-19)	

- (W) 7/16 Withdraw w/o appearing on transcript
- (F) 8/1 Convert letter grade to Credit/D/Fail or withdraw