

FOOD 3001

FOOD CHEMISTRY Fall 2026

We, the people of the Faculty of Science at Carleton University, acknowledge that our campus is located on the traditional, unceded territories of the Algonquin Anishinabeg people. Miigwetch for your hospitality and stewardship of this territory and the teachings that come from it. We are grateful for this land, the air that we breathe, and the water that sustains us all as well as for the animals, plants and other living beings: these enable us to research, teach, mentor, support, study, and learn. We recognize our responsibility to our natural environment and to reconciliation with Indigenous peoples.

Course Instructor: Apollo Tsopmo

Gender Pronouns: (He/Him)

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Best Ways to be in Touch: in class, via email, or during student hours

Student Hours: By appointment in room SC207D

Office Location: Room 207D Steacie Building

Class Location: Please check Carleton Central for the room location.

Class Times: Tues & Thu, 11:30 am – 1:00 pm

Prerequisites: FOOD 2001, CHEM 2204 (Organic Chemistry), BIOC 2200 (Cellular Biochemistry).

Department/Unit: Chemistry

Lab Coordination: Gabriela Campos Espinosa (She/Her)

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TA (Lab): Winifred Akoetey (She/Her)
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Topics Covered and Learning Outcomes

Inclusive Learning Environment

Food chemistry draws on diverse perspectives, experiences, and ways of thinking to deepen our understanding of the chemical properties and reactions that influence food quality, functionality, and nutritional value. I am committed to fostering a respectful, welcoming, and inclusive learning environment where all students feel valued and encouraged to participate. I encourage students to engage thoughtfully with lectures, laboratory activities, and discussions, contribute their ideas, and approach scientific questions with curiosity, professionalism, and respect for differing viewpoints. My goal is to create a learning environment that supports evidence-based inquiry, critical thinking, and the development of confidence in both scientific knowledge and laboratory skills

Topics to be covered

This course deals with the structure, properties, composition and reactions of food constituents. It is an application of fundamental laws and concepts of chemistry to properties that account for flavour, texture, colour, stability, and nutritional values of foods. Emphasis will be on the mechanisms of those reactions that involve carbohydrates, proteins, lipids, and pigments.

Week	Topic/Content	Readings/Prep for Class
1	INTRODUCTION TO FOOD CHEMISTRY	Chapter 1
2	WATER and ICE – Fundamental Properties / Structure – Availability in Foods – Water Activity / Food Stability	Chapter 13
3	3. CARBOHYDRATES – Structure and Isomerism – Reactions of Carbohydrates – Functions of Monosaccharides and Oligosaccharides – Functions of Polysaccharides	Chapters 2 & 3
4	4. PROTEINS – Amino Acids / Basic Building Blocks – Peptides and Proteins, Denaturation – Functional & Nutritional Properties – Protein Modification / Processing and Storage – Maillard Browning	Chapter 5
5	LIPIDS – Fatty Acid, Glycerides	Chapter 4

	– Physical Aspects, Chemical Aspects – Fat and Oil Processing – Role of Food Lipids	
6	ENZYMES – Specificity, Catalysis and Regulation – Factors Influencing Activity, Endogenous Enzymes, Enzymes Added to Food / Processing	Chapter 12
7	COLOUR – Carotenoids, Anthocyanins, Betalaines/Melanin – Artificial food colourants – Molecular basis of food colourants	Chapter 6
8	FLAVOUR – Taste – Odour	Chapter 7
9	FOOD ADDITIVES	Chapter 9
10	Laboratory experiments – Perform experiments – Data analysis – Reports	Lab manual on Brightspace

Important dates and deadlines can be found here: <https://calendar.carleton.ca/academicyear/>, including class suspensions for fall, winter breaks, and statutory holidays.

Learning Outcomes:

By completing this course, you will

- Describe the importance of water in foods and its effect on the quality of foods
 - Define the physical state of water and illustrate phase diagrams
 - Describe the different types of water present in foods
 - Calculate the water available in foods
 - Explain how water present in foods affects chemical reactions and the quality of foods
- Describe structures, chemical properties, and reactions of major food components
 - Draw the structures of carbohydrates, proteins and lipids
 - Classify nutrients in groups based on chemical and physical properties
 - Demonstrate proficiency in the use of chemical reactions to explain changes in nutritional quality, texture, colour, and flavours of foods under various conditions
- Demonstrate knowledge of the use of additives in foods
 - Describe the rationale behind the use of additives and the way they can affect food attributes
 - Elucidate chemical reactions of additives with food components
 - Discuss health and safety that may be associated with food additives

4. Demonstrate basic knowledge and understanding of the application of enzymes in foods
 - a. Describe the classification of enzymes based on chemical reactions that they catalyze
 - b. Explain the effect of enzymes on food quality
 - c. Calculate the enzyme activity and enzymatic reaction rates
 - d. Elucidate the chemical and physical parameters affecting enzymes reactions
5. Conduct appropriate laboratory experiments common to basic and applied food chemistry, and interpret results.
 - a. Work cooperatively in a team to solve a food chemistry problem by conducting experiments, analyzing and interpreting the data.
 - b. Demonstrate analytical proficiency to obtain accurate data
 - c. Write chemical reactions that account for change observed
 - d. Proficiently and safety use laboratory instruments
6. Analyze data obtained from food chemistry laboratory experiments
 - a. Apply appropriate calculations to data to explain physical or chemical changes to foods
 - b. Present results in the form of graphs or tables
7. Clearly communicate research results using appropriate written and visual communication techniques (Laboratory experiment reports)

Assessments

Grade breakdown

COMPONENT	GRADE VALUE
ASSIGNMENT 1	20%
MIDTERM EXAM	20%
EXAM COMPREHENSIVE	30%
LABORATORY REPORTS	30%

Assignment: Effect of processing on the chemistry and quality of foods. Chemical reactions involving simple sugars, construction and interpretation of moisture sorption isotherms, chemistry of physical and chemical modified polysaccharides, chemistry and reactions involving food proteins.

Exams: Enzymatic reactions (chemistry, kinetic), identify food colorants and their possible modifications under various conditions, lipid structures and their chemical reactions, chemistry of methods to characterize, lipids, proteins, or polysaccharides, chemistry and molecular mechanisms of flavoring molecules.

Late and Missed Work Policies

Late assignments: A penalty of 10% will be applied for the first two days. No submission beyond the two days will be accepted on Brightspace unless it falls under the two categories below

- 1) Missed work less than 5 days (assignments):** Complete a self-declaration using the online [Academic Consideration for Coursework Form](#). If you don't have medical documentation.
- 2) Missed work longer than 5 days:** Submit the [Long Term Academic Consideration Request Form](#).

Missed Midterm exam: For approved requests, the instructor will arrange an extension for the assignment or another date for writing the test, in most cases, at the time at which the class is generally held.

Learning Material and Course Related Resources

Learning Material	Options for Purchasing (e.g. Bookstore, Used, etc.)	Approximate Cost
Highly recommended Textbook: Food: The Chemistry of its Components: 2023. By Tom Coultate, ISBN 978-1-83916-814-7.	- Electronic version available through the library Bookstore,	\$65

Additional Resources:

Introduction to Food Chemistry:

By Vassilis Kontogiorgos, 2024. Springer Publishing,

[There is no restriction on using a second-hand copy of the textbook or learning material](#)

Academic Accommodations and Regulations

Carleton is committed to providing academic accessibility for all individuals. You may need special arrangements to meet your academic obligations during the term. The accommodation request processes, including information about the Academic Consideration Policy for Students in Medical and Other Extenuating Circumstances, are outlined on the Academic Accommodations website (<https://students.carleton.ca/course-outline/>).

Statement on Generative Artificial Intelligence

As our understanding of the uses of GenAI and its relationship to student work and academic integrity continue to evolve, students are required to discuss their use of GenAI in any circumstance not described here with the course instructor to ensure it supports the learning goals for the course.

Assistance for Students

Academic and Career Development Services: <http://carleton.ca/sacds/>

Writing Services: <http://www.carleton.ca/csas/writing-services/>

Peer Assisted Study Sessions (PASS): <https://carleton.ca/csas/group-support/pass/>

Math Tutorial Centre: <https://carleton.ca/math/math-tutorial-centre/>

Science Student Success Centre: <https://sssc.carleton.ca/>

Statement on Academic Integrity

Students are expected to uphold the values of academic integrity, which include fairness, honesty, trust, and responsibility. Examples of actions that compromise these values include but are not limited to plagiarism, accessing unauthorized sites for assignments or tests, unauthorized collaboration on assignments or exams, and using Generative Artificial Intelligence (GenAI) tools when course assessment instructions indicate such use is not permitted.

Misconduct in scholarly activity will not be tolerated and will result in consequences as outlined in Carleton University's Academic Integrity Policy. A list of standard sanctions in the Faculty of Science can be found here.

Additional details about this process can be found on the Faculty of Science Academic Integrity website.

Students are expected to familiarize themselves with and abide by Carleton University's Academic Integrity Policy.

Student Rights & Responsibilities

Students are expected to act responsibly and engage respectfully with other students and members of the Carleton and the broader community. See the 7 Rights and Responsibilities Policy for details regarding the expectations of non-academic behaviour of students. Those who participate with another student in the commission of an infraction of this Policy will also be held liable for their actions.

Student Concerns

If a concern arises regarding this course, **your first point of contact is me**: Email or drop in during student hours and I will do my best to address your concern. If I am unable to address your concern, the next points of contact are (in this order):

Note: You can also bring your concerns to Ombuds services.

