

CHEM 005

Kitchen Chemistry

Sample Syllabus

Description

CHEM 005 incorporates reading, problem-solving, and 'edible' home experiments to develop an understanding of chemical concepts and scientific inquiry within the context of food and cooking. Prior study of chemistry is not assumed, but you should have taken at least one class in algebra before taking CHEM 005. For some students, CHEM 005 provides the chemistry required by their major area of study. For other students, CHEM 005 provides review and preparation for subsequent Chemistry classes such as CHEM 110 (Chemical Principles I) and CHEM 130 (Introduction to General, Organic, and Biochemistry).

Objectives

When you successfully complete this course, you will be able to:

- Read and critically analyze the nutritional facts on food labels
- Recognize functional groups and understand the difference in the structures and properties of the main macromolecules in food
- Understand polarity and its effect on the unique properties of water
- Define the pH scale, identify acids and bases in common household items, and understand the effect of pH on cooking of foods
- Interpret a phase diagram and understand ways of manipulating phase diagram in cooking
- Describe the structural and textural changes of fruits and vegetables before and after cooking
- Understand the underlying principles that are at work in the various ways that chefs thicken sauces
- Understand how chocolate melts and the tempering process
- Describe the roles of caffeine and other chemicals in coffee and tea
- Identify appropriate ingredient choices for specific baking application
- Describe the chemical reactions that take place during the preparation and cooking of foods

Materials

Access to a basic functional kitchen and Food/ingredients and equipment for weekly labs. A complete list of required cooking equipment and ingredients for weekly labs can be found [here](#) . Note: Please look through this list carefully and make sure that you have ways to either purchase or borrow any ingredients/equipment that you do not already have in your kitchen. Your cost for the lab activities will depend on how fully stocked your kitchen is, and please keep receipts for any equipment or ingredients you buy specifically for this course.

You'll need to order the following two items as soon as possible to ensure lab success.

- Thermometer (that has temperature range of - 40 to 230 oC). A multifunctional instant read thermometer, such as [Lavatools Thermowand](#) (cost about \$25), is a great choice for this course, as well as cooking meat, deep-frying, or making candy and jam.'
- Kitchen scale (1g resolution or better). Recommended: [Ozeri Pronto Digital Multifunction Kitchen and Food Scale](#) (cost about \$16)

Textbook

[On Food and Cooking: The Science and Lore of the Kitchen](#) , by Harold McGee, Scribner; Rev Upd edition (November 23, 2004), ISBN: 978-0684800011 (cost about \$25).

Supplemental Textbook

[Chemistry for Dummies](#) by John T. Moore, 2nd edition (May 31, 2011), ISBN-13: 978-1118007303 (cost about \$15). Many students from previous semesters have found this book to be helpful to simplify some of the complex Chemistry topics.

Course Schedule

Week	Topic
1	Course Preparation

2	Matter and Measurement
3	Food Components
4	Water
5	Energy, Temperature, and Heat
6	Midterm Exam 1
7	Phase Transition
8	Vegetables and Fruits
9	Starch and Sauces
10	Chocolate
11	Midterm Exam 2
12	Coffee and Tea
13	Baking
14	Browning Reactions
15	Fermentation
16	Final Project Assignments (Canvas)

Assignments

This course consists of 12 lessons. For each lesson you will complete the reading and lesson assignments. In addition, you will conduct lab activities for most of the lessons, and contribute to the course discussion regularly.

Orientation Activities

Orientation Activities (total worth 20 points): During the first week of the class, you will conduct some orientation activities on Canvas: take a food safety quiz (worth 5 points), take a course syllabus quiz (worth 5 points), submit the signed food safety and academic integrity contracts (worth 5

points), and complete an introduction discussion assignment (worth 5 points).

Lesson Assignments

Lesson Assignments (12 total, each worth 10 points): Each lesson will have a lesson assignment (on Canvas) which may include fill-in-the blank, short essay, and multiple choice questions. See course schedule for deadlines for each lesson assignment. The goal of these assignments are for you to understand and apply the materials learned from the lesson contents. You are allowed to use your notes and may need to research on the internet when complete these assignments. For each lesson assignments, you will have two attempts with a 60 minutes time limits, and the highest score counts towards your overall grade. There will be 12 lesson assignments, and each worth 10 points.

Lab Reports

Lab Reports (10 total, each worth 20 points): Most of the lessons will have a lab activity performed individually by the student. Each experiment will have a lab report submitted consisting of experimental data, observations (and pictures, when applicable), and short answers to interpretive questions. See course schedule for deadlines for each lab report. There will be 10 lab report total, each worth 20 points.

Course Discussions

Course Discussions (6 total, each worth 10 points): In this course, we will use Canvas Discussion Forum to discuss food and cooking with each other. You will regularly contribute and comment on your classmates' posts in response to required readings and class discussions. See course schedule for deadlines for each discussion assignment. The grading rubrics for discussion contributions is posted on Canvas.

Mid-Term Exams

Self-Proctored Online Mid-Term Exams (2 total, each worth 120 points): There will be two mid-term exams in the semester where you will have the opportunity to show how well you have learned the course material. The exams will be delivered through Canvas, and they will be worth 120 points each.

Final Project

Self-Proctored Final Project (worth 160 points): You will carry out your own scientific study of some recipe or aspect of cooking in your own kitchen. Guidelines and further information about the final project will be available on Canvas under Final Project Module.

Grading

Assignments (Canvas)	Number	Points Each	Total Points	% of Course Grade
Orientation Activities	4	5	20	2.5%
Lesson Assignments	12	10	120	15%
Lab Reports	10	20	200	25%
Course Discussions	6	10	60	7.5%
Mid-Term Exams	2	120	240	30%
Final Project Report	1	160	160	20%
Final Project Photo/Video Discussion (Extra Credit)	1	20	20	2.5%
Total			800	100%

Grade Scale

Letter Grade	Total Points	% of Course Points
A	724-800	90.5-100%
A-	708-723	88.5-90.4%
B+	692-707	86.5-88.4%
B	636-691	79.5-86.4%

B-	620-635	77.5-79.4%
C+	604-619	75.5-77.4%
C	532-603	66.5-75.4%
D	452-531	56.5-66.4%
F	< 451	< 56.4%

Late Submission Policy

Meeting assigned due dates is critical for demonstrating progress and ensuring appropriate time for instructor feedback on assignments. We recommend that you try to complete the assignments as close to the scheduled time as possible.

However, sometimes students are unable to meet due dates. In those rare cases, the following late submission policy applies:

- There is a 3-day grace period on all due dates, except midterm exams, assignments for Lesson 12, and the final project. For example, the lab 1 report is due at 11:59 pm Eastern Standard Time (EST) Sunday September 2, however you'll still receive full credit if you submit the report by 11:59 pm EST Wednesday September 5.
- With the exception of the midterm exams, assignments for Lesson 12, and the final project, you may submit assignments late up until the last day of the semester. Note that each Canvas assignment will automatically stop accepting submission after the 3-day grace period, so instructor approval is needed for late submissions. A penalty of ten percent (10%) per week will be applied to the grade you achieved on the assignment for each week the assignment is submitted after the deadline.
- Assignments will not be accepted after the last day of the semester unless a Deferred Grade has been approved by the instructor.
- I will grade late submitted assignments no later than a week after you submit the assignment. Be sure to notify me of the late submission and to ensure that I have received the assignment. The full ten percent (10%) late penalty for each week applies regardless of the day of the week you submit your work.

- I may accept late work for full credit in the case of extenuating circumstances (such as hospitalization, childbirth, major accident or injury and bereavement). You should notify me immediately of any extenuating circumstances that prevent you from submitting your work on time.

Academic Integrity

Academic integrity is the pursuit of scholarly activity in an open, honest and responsible manner. Academic integrity is a basic guiding principle for all academic activity at The Pennsylvania State University, and all members of the University community are expected to act in accordance with this principle. Consistent with this expectation, the University's Code of Conduct states that all students should act with personal integrity, respect other students' dignity, rights and property, and help create and maintain an environment in which all can succeed through the fruits of their efforts.

Academic integrity includes a commitment by all members of the University community not to engage in or tolerate acts of falsification, misrepresentation or deception. Such acts of dishonesty violate the fundamental ethical principles of the University community and compromise the worth of work completed by others.

Accommodating Disabilities

Penn State welcomes students with disabilities into the University's educational programs. Every Penn State campus has an office for students with disabilities. The [Student Disability Resources \(SDR\) website](#) provides contact information for every Penn State campus . For further information, please visit [Student Disability Resources website](#).

In order to receive consideration for reasonable accommodations, you must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentation: [See documentation guidelines](#) . If the documentation supports your request for reasonable accommodations, your campus disability services office will provide you with an accommodation letter. Please share this letter with your instructors and discuss the accommodations with them as early as possible. You must follow this process for every semester that you request accommodations.

Counseling and Psychological Services

Many students at Penn State face personal challenges or have psychological needs that may interfere with their academic progress, social development, or emotional wellbeing. The university offers a variety of confidential services to help you through difficult times, including individual and group counseling, crisis intervention, consultations, online chats, and mental health screenings. These services are provided by staff who welcome all students and embrace a philosophy respectful of clients' cultural and religious backgrounds, and sensitive to differences in race, ability, gender identity and sexual orientation.

- [Counseling and Psychological Services at University Park \(CAPS\)](#): 814-863-0395
- [Counseling and Psychological Services at Commonwealth Campuses](#)
- Penn State Crisis Line (Available 24 hrs, 7 days a week): 877-229-6400
- Crisis Text Line (Available 24 hrs, 7 days a week): Text LIONS to 741741

Educational Equity / Report Bias

Penn State takes great pride to foster a diverse and inclusive environment for students, faculty, and staff. Acts of intolerance, discrimination, or harassment due to age, ancestry, color, disability, gender, gender identity, national origin, race, religious belief, sexual orientation, or veteran status are not tolerated and can be reported through Educational Equity via the [Report Bias website](#).