Term Information

Effective Term	Spring 2024
Previous Value	*Spring 2014*

Course Change Information

What change is being proposed? (If more than one, what changes are being proposed?)

Request GEN classification

What is the rationale for the proposed change(s)?

This is a revision to a previously approved legacy GE Natural Sciences (physical) course to add an experiential (laboratory) component that will qualify the course to satisfy the new GE Natural Science requirements. The revised course will remain a fully distance learning (asynchronous) course. The overall goals of the course are to develop skills of scientific and technological literacy, to develop a better understanding of the natural world, and to improve students' ability to make informed decisions about chemistry-based issues at domestic and societal levels. The experiential component that has been developed for this course is designed to be able to be fully completed in an at-home (or in-dorm) setting, with a combination of supplies purchased as part of a required "lab kit" (currently being sourced to minimize cost and ensure safety) and a minimal set of supplies that are readily available to students (i.e. microwave-safe mug to heat water, disposable plastic drink bottles, etc)

What are the programmatic implications of the proposed change(s)?

(e.g. program requirements to be added or removed, changes to be made in available resources, effect on other programs that use the course)?

No program implications.

Is approval of the requrest contingent upon the approval of other course or curricular program request? No

Is this a request to withdraw the course? No

General Information

Course Bulletin Listing/Subject Area	Chemistry
Fiscal Unit/Academic Org	Chemistry - D0628
College/Academic Group	Arts and Sciences
Level/Career	Undergraduate
Course Number/Catalog	1100
Course Title	Chemistry and Society
Transcript Abbreviation	Chem and Society
Course Description	Terminology, methods, and principles of chemistry; examination of the roles of chemistry in our modern technological society.
Semester Credit Hours/Units	Fixed: 4
Previous Value	*Fixed: 3*

Offering Information

Length Of Course	14 Week, 12 Week
Flexibly Scheduled Course	Never
Does any section of this course have a distance education component?	Yes
Is any section of the course offered	100% at a distance
Previous Value	*Yes, Greater or equal to 50% at a distance*

Grading Basis	Letter Grade
Repeatable	No
Course Components	Laboratory, Lecture
Previous Value	*Lecture*
Grade Roster Component	Lecture
Credit Available by Exam	No
Admission Condition Course	No
Off Campus	Never
Campus of Offering	Columbus, Lima, Mansfield, Marion, Newark, Wooster
Previous Value	*Columbus, Lima, Mansfield, Marion, Newark*

Prerequisites and Exclusions

Prerequisites/Corequisites	Prereq: Math 1050 or an ACT math subscore of 22 or higher that is less than two years old, or satisfactory score on Ohio State Math Placement Test.
Previous Value	*Prereq: Math 1050 (075 or 076) or an ACT math subscore of 22 or higher that is less than two years old, or satisfactory score on Ohio State Math Placement Test.*
Exclusions	Not open to students with credit for Chem 1110, 1210, 1610, 1910H, or any Chem course that uses these courses as prerequisites.
Previous Value	Not open to students with credit for 1110 (101), 1210 (121), 1910H (201H), or 100, or any Chem course that uses these courses as prerequisites.
Electronically Enforced	No

Cross-Listings

Cross-Listings

Subject/CIP Code

Subject/CIP Code	40.0501
Subsidy Level	General Studies Course
Intended Rank	Freshman, Sophomore, Junior, Senior

Requirement/Elective Designation

General Education course:

Physical Science; Natural Sciences

The course is an elective (for this or other units) or is a service course for other units

Previous Value

General Education course:

Physical Science

The course is an elective (for this or other units) or is a service course for other units

Course Details

Course goals or learning objectives/outcomes

- Explain basic facts, principles, theories and methods of modern chemistry and describe and analyze the process of scientific inquiry, including understanding how current and historic events that contribute to the nature of chemistry knowledge
- Analyze the impacts of new developments in the chemical sciences and technology on the nature of the world around us, as well as social and ethical implications of these topics.
- Equip students to critically evaluate and responsibly use information from the chemical sciences.
- Equip students to critically evaluate and responsibly use information from the chemical sciences.

Previous Value

- *Learn the basic facts, principles, theories and methods of chemistry within social, political or topical contexts*
- *Taught key discoveries and events in the more recent history of science*
- *Learn to think scientifically*

Content Topic List

- Introductory chemistry (Names, notations, formulas, molecular representations
- Radium and Radon
- Ozone in the atmosphere, including greenhouse gasses
- Lead, including in our water supply
- Carbon Dioxide: in the kitchen, the environment and our bodies
- Community Chemicals- road salt
- Household chemicals
- Sugar and Carbohydrates

Previous Value

- *The air we breathe*
- *Acid rain*
- *Climate change*
- *Energy*
- *Fossil fuels and alternative energy sources*
- *Water*
- *Everyday nutrition*
- *Chemical forensics*

Sought Concurrence

No

Attachments

- CHEM1100 AU23 Distance Learning Syllabus Final Draft.docx: Course Syllabus

  (Syllabus. Owner: Ramirez,Ana G)
- Sample Plan ice melt.docx: Lab Plans Sample

  (Other Supporting Documentation. Owner: Ramirez,Ana G)
- Ch1100-ge-foundations-submission.pdf: GE Foundation Submission

  (GEC Model Curriculum Compliance Stmt. Owner: Ramirez,Ana G)
- CHEM1100 SP23 RicciardoOttesen ASC Distance Learning Syllabus.pdf: Distance Learning

  (Other Supporting Documentation. Owner: Ramirez,Ana G)
- Ch1100_asc-distance-approval-cover-sheet.pdf: Distance Approved Sheet

  (Other Supporting Documentation. Owner: Ramirez,Ana G)
- Chem1100_NewDLTemplate_Spring24.pdf: Distance Learning Template

  (Other Supporting Documentation. Owner: Ramirez,Ana G)

Comments

- Added Chem 1100 ASC DDDDL approval cover sheet and DL template. *(by Ramirez,Ana G on 09/26/2023 09:42 AM)*

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Ramirez,Ana G	04/21/2023 05:10 PM	Submitted for Approval
Approved	Jackman,Jane E	04/21/2023 05:11 PM	Unit Approval
Revision Requested	Vankeerbergen,Bernadette Chantal	04/23/2023 08:14 AM	College Approval
Submitted	Ramirez,Ana G	09/26/2023 09:42 AM	Submitted for Approval
Approved	Jackman,Jane E	09/26/2023 10:38 AM	Unit Approval
Approved	Vankeerbergen,Bernadette Chantal	10/03/2023 10:10 AM	College Approval
Pending Approval	Jenkins,Mary Ellen Bigler Hanlin,Deborah Kay Hilty,Michael Neff,Jennifer Vankeerbergen,Bernadette Chantal Steele,Rachel Lea	10/03/2023 10:10 AM	ASCCAO Approval

Syllabus
Chemistry & Society

Chem 1100, SP 2024

Course Information

- **Course times and location:** Synchronous component: Tuesdays, 3:00-3:55 PM in Zoom. Further asynchronous instruction occurs in Carmen each week.
- **Credit hours:** 4
- **Format of Instruction:** Distance synchronous & asynchronous lecture, with asynchronous lab
- **Mode of delivery:** Distance Learning

Instructor

- **Name:** Jennifer Ottesen
- **Email:** ottesen.1@osu.edu
- **Office location:** 780 Biological Sciences Bldg
- **Office hours:** 1 hour per week by zoom, tbd
- **Preferred means of communication:**
    - My preferred method of communication for questions is **email** sent through the Carmen messaging portal**.**
    - My class-wide communications will be sent through the Announcements tool in CarmenCanvas. Please check your notification preferences (go.osu.edu/canvas-notifications) to be sure you receive these messages.

Teaching Assistant

- **Name:** tbd
- **Email:** tbd
- **Office hours times:** GTA will be available by zoom for at least 4 hours scheduled over Thursdays and Fridays, with special focus on supporting the experiential learning component

Course Prerequisite

Math 1050 or an ACT math subscore of 22 or higher that is less than two years old, or satisfactory score on Ohio State Math Placement Test. Not open to students with credit for Chem 1110, 1208, 1210, 1910H, or any Chemistry course that uses these courses as prerequisites.

Course Description

This course will examine the dilemma that we face in our modern world of attempting to balance the great benefits of modern chemical sciences and technology with the risks that accompany those benefits, through the lens of chemicals that have changed the world around us. Chemistry is often called the central science, and this course is designed to introduce students to the way in which chemical concepts can be used to interpret the physical world. We will discuss the chemistry of our daily lives, as well as large scale social, political, economic, and ethical issues facing science and society today. The main objective is to help students become more scientifically and technologically literate, to understand the chemistry of the natural world, and improve their ability to make informed decisions about chemistry-based issues at domestic and societal levels. This course satisfies the requirements for GEN Natural Science and GEL Natural Science, physical; see the appropriate section for detail.

New General Education (GEN) Expected Learning Outcomes

As part of the Natural Science category of the General Education curriculum, this course is designed to prepare students to be able to do the following:

Goals

1. Successful students will engage in theoretical and empirical study within the natural sciences while gaining an appreciation of the modern principles, theories, methods, and modes of inquiry used generally across the natural sciences.

2. Successful students will discern the relationship between the theoretical and applied sciences while appreciating the implications of scientific discoveries and the potential impacts of science and technology.

Expected Learning Outcomes

Successful students are able to:

1.1. Explain basic facts, principles, theories, and methods of modern natural sciences, and describe and analyze the process of scientific inquiry.
1.2. Identify how key events in the development of science contribute to the ongoing and changing nature of scientific knowledge and methods.

1.3. Employ the processes of science through exploration, discovery, and collaboration to interact directly with the natural world when feasible, using appropriate tools, models, and analysis of data.

2.1. Analyze the inter-dependence and potential impacts of scientific and technological developments.

2.2. Evaluate social and ethical implications of natural scientific discoveries.

2.3. Critically evaluate and responsibly use information from the natural sciences.

This course fulfills these learning outcomes by:
Chemistry is often called the central science, and this course examines that concept through the lens of chemicals that have changed human societies and lived environments. We explore the influence of technological developments in chemistry on history, economics, and climate through radon, lead, ozone, and sugar. We investigate some of the ways in which humans use chemistry to control their lived environment through common household and community chemicals used in our everyday lives – as well as the biological molecules that make up our bodies. Students will engage directly with fundamental chemical principles and concepts, and with the processes that are used to translate these fundamental principles into practice through the process of scientific inquiry. Throughout, we will examine the dilemma that we face in our modern world of attempting to balance the great benefits of modern chemical sciences and technology with the risks that inevitably accompany those benefits.

ELOs 1.1 and 1.2 will be directly addressed in lectures and readings, and will be assessed in quizzes, assignments, and the Intermediate Exams throughout the semester. ELO 1.3 will be accomplished through experiential learning exercises designed to be completed independently. These will be paired with a focus on ELOs 2.1-2.3 in each set of linked content modules.

Experiential components within each module will support and direct students in engaging in scientific inquiry, through a combination of hands-on exercises and explorations of the natural world and simulations of complex phenomena.

Legacy General Education (GEL) Expected Learning Outcomes

As part of the Natural Science, physical science category of the General Education curriculum, this course is designed to prepare students to be able to do the following:

Goals

Students understand the principles, theories, and methods of modern science, the relationship between science and technology, the implications of scientific discoveries and the potential of science and technology to address problems of the contemporary world.

Expected Learning Outcomes

1. Students understand the basic facts, principles, theories, and methods of modern science.
2. Students understand key events in the development of science and recognize that science is an evolving body of knowledge.
3. Students describe the inter-dependence of scientific and technological developments.
4. Students recognize social and philosophical implications of scientific discoveries and understand the potential of science and technology to address problems of the contemporary world.

How this course satisfies these Learning Outcomes

Chemistry is often called the central science, and this course examines that concept through the lens of chemicals that have changed human societies and lived environments. We explore the influence of technological developments in chemistry on history, economics, and climate through radon, lead, ozone, and sugar. We investigate some of the ways in which humans use chemistry to control their lived environment through common household and community chemicals used in our every day lives – as well as the biological molecules that make up our bodies. Students will engage directly with fundamental chemical principles and concepts, and with the processes that are used to translate these fundamental principles into practice through the process of scientific inquiry. Throughout, we will examine the dilemma that we face in our modern world of attempting to balance the great benefits of modern chemical sciences and technology with the risks that inevitably accompany those benefits.

ELOs 1 and 2 are emphasized in our course textbook and lecture content, and will be directly assessed in quizzes, assignments, and module exams throughout the semester. These will be paired with an additional focus on ELOs 2-4 in the lecture content and assignments for each module.

For example, the linked modules centered around lead will introduce fundamental chemistry concepts that include chemical measurements and equations, the behavior of ions, and properties of solutions and mixtures (ELO 1). These will be paired with discussions of different ways lead has been used as a material in human products and environments throughout history (ELO 3), our growing awareness of the biological implications of lead as a toxin (ELO 2), and a discussion of current crises of lead contamination in drinking water in the United States, using Flint, MI as a focal point (ELO 4).

As another example, we return to carbon dioxide and to the bicarbonate buffering system as a running theme and model system through several modules, from addressing societal attitudes about “natural” vs “chemical” processes in Module 2 (ELO 4), to investigating the natural gas laws (Module 3, ELO 1), to the history and development of baking powder (Module 8, 3), to the relationship of atmospheric CO_2 and ocean acidification (Module 8, ELO 4), to the biological bicarbonate blood buffering system (ELO 1).

How This Online Course Works

Mode of delivery: This course is 100% online. There is a **required synchronous (real-time)** session in Zoom each week on **Tuesdays from 3:00-3:55 PM**. The rest of your work is found in Carmen and can be completed around your own schedule. However, please note that some modules will have an **intermediate deadline** for some assignments. See "Pace of Online Activities" for more details.

Big Picture Idea: This class is titled Science and Society, and different parts of the course are designed to support this in different ways.

- The textbook is a good support for core chemistry content – the "science" part of the class. Each week you will have an assigned reading and an online "Mastery" science content assignment using the learning system. However, we're going to go beyond that! There will be required content in our lectures that is not in the textbook.
- We will have one synchronous class each week, and asynchronous faculty lecture videos. These will support both the science content and the intersection with society and history.
- Each week, you will have an activity or assignment that requires you to dig deeper into the intersection of science with society. Some weeks, this will be in the format of a problem set; other weeks it may take the shape of shared posts on Carmen, or a graphical presentation. You should expect this assignment to typically take 2-4 hours and require some independent thinking and research.
- Each week, you will engage in the process of science in some way that is linked to the chemistry content for the week. You should expect to spend on average 3 hours per week on this laboratory/experiential component.

Pace of online activities: This course is divided into **weekly modules** that are intended for a Tuesday through Monday work week. Below, you will find a summary of the typical weekly schedule, followed by a more detailed description of a typical work week.

- **Monday**: Module Overview is posted a day ahead.
  Tuesday: **Module begins**, and we have our synchronous class (3pm!)
  Thursday morning: Any post-class supplemental videos or readings are posted
  Saturday 11:59 PM: Intermediate deadline for any time-sensitive assignments. You are more than welcome to submit by Friday, but we extended as far as we could for increased flexibility.
  Following Monday night: **Module ends.** You want to consider Monday night as your internal deadline for submitting all work to get it out of the way before the next module. However, we'll accept all assignments until **Tuesday 11:59 PM** without penalty, since students have expressed that this extra week day (and chance to talk to the instructor) reduces their stress level. Since the Tuesday due date already has 24 hours extension baked in, it will be strictly enforced!
- On the Monday before the module opens, we will post the **Module Overview** that will lay out the introduction, context, and structure for the upcoming module. It will specify

whether any module elements will require the Saturday Intermediate Deadline, provide estimated time for completion of each learning activity to help you plan your week, and lay out the precise point distribution that will feed into the **Module Grade**.

- The second section of each module is titled "**Gathering Information**". Here, you will find the direct link to your **textbook reading assignment** (these will take you directly to the assigned sections), any **supplemental reading**, and any **faculty lecture videos** that supplement the synchronous lecture. There will be some weeks where you will see a placeholder link when the module opens, if we need to scaffold learning materials (or record faculty lectures) around the Tuesday synchronous session. These placeholders will be filled by **Thursday at 9:00 AM** to give me ~36 hours to complete any customized materials after class!
- The third section of the module is titled "**Assessment and Engagement**" In a typical week, you will see a **reading quiz** (using the online Mastering/MyLab system) that will take you through mastery of the textbook reading assignment, and an **Assignment** that will ask you to dig deeper into the ideas and skills tbat we are focusing on that week. The **Assignment** will typically open on Wednesday, and successful completion will typically require the materials from **Gathering Information**. Some weeks may have **TopHat** engagement opportunities during the synchronous class session; if they are planned for the week, they will be specified here.
- The fourth section of the module will be titled **"The Processes of Science".** Here, you will find instructions and scaffolding for your weekly lab. If there are any intermediate deadlines, this section will be divided with clear labels and submission instructions. You will have deliverables every week – most often a **Lab Report** in the form of a worksheet. Make sure you have looked this through before diving into the experiment! For example, we will often have you include pictures or notes from early stages of your experiment in your Experiential Report; if so, you will want to make sure that you document them!
- Every 3 content modules, you will have an **Intermediate Exam** (4 total). While these will be focused on those three modules, you will see that some concepts continue to return throughout the course! These foundational concepts will continue to be required after the exam has ended. The exam will be available Friday 9AM through Tuesday 11:59 PM, will be timed, and will take 1 hour.

Credit hours and work expectations: This is a **4** credit-hour course that includes an experiential learning component. According to Ohio State bylaws on instruction (go.osu.edu/credithours), students should expect around **12** hours per week of time spent per week to receive a grade of C average. Since this course has approximately a 75/25 split between traditional and experiential learning, this works out on average to **3** hours per week of direct instruction (instructor content and Carmen activities, for example) in addition to **6** hours of homework (reading and assignment preparation, for example) and **3** hours per week spent on the experiential/laboratory component (not necessarily sequentially).

Attendance and participation requirements: Research shows regular participation is one of the highest predictors of success. With that in mind, I have the following expectations for everyone's participation:

- **Participating in online activities for attendance**:
  You are expected to log in to the course in Carmen every week. During most weeks a successful student will log in many times. If you have a situation that might cause you to miss an entire week of class, discuss it with me *as soon as possible.*
- **Zoom meetings**:
  The weekly synchronous class is required. I expect to post recordings of the Tuesday class sessions for those who cannot attend, but the TopHat points available during those synchronous classes will not have makeup opportunities unless there are extreme circumstances
- **Other live, scheduled events**: All other live, scheduled events, including my office hours, and the GTA's office hours, are optional.
- **Participating in discussion forums**:
  In some weeks, you will be asked to take part in online discussion forums, either as a part of your assignment, or as part of the your weekly lab / process of science activity (for example, sharing data with your group for analysis). A typical discussion week will have two parts: an initial post (typically at the Intermediate Deadline of Saturday 11:59 PM), and a response period (until Tuesday 11:59 PM) to allow you and your classmates to review and think about posts.
- **Carry out process of science / laboratory projects**

  While the lab component is designed to be completed independently, the GTA will be available for at least 4 hours of office hours between Thursday and Friday (detailed schedule tbd) by zoom, with a particular focus on supporting students with their distance laboratory components. The GTA may post recordings of portions of these events if they appear to be useful to students who cannot or did not attend; we will assess this as the semester progresses.

Course Materials, Fees and Technologies

Required Course Materials

- **Textbook:** We will use a required textbook for this course: Hill's Chemistry for Changing Times, 15th Edition (Pearson). It is distributed through CarmenBooks, and can be accessed through your web browser on the Carmen website. Because we will use the Mastering system for homework, I am not aware of any alternate pathways to access this material.
- **Laboratory Kit:** A laboratory kit assembled by the Department of Chemistry & Biochemistry will be available at cost for pickup during the first week of classes at [details being finalized; working with the Chemistry Prep Lab on this. We are finalizing testing but expect the price to be $18-$35 depending on the results of one particular test]. Contact the instructor at least 3 weeks before the first day of classes if you will need a kit shipped within the domestic United States. At this time, we cannot ship outside of the country. A list of the components is available on request such that the student can purchase them on their own. The kit will be provided in a container with a lid for easy storage.

  We expect the maximum price to be $35. Please see Additional Requirements for other considerations for turning your home into your experiment site in distance learning!

Recommended/Optional Materials and/or Technologies

- **Calculator:** We recommend any device that can add, subtract, multiply, divide, and calculate exponents as a VERY helpful support for this course.

Fees and/or Additional Requirements

- The materials in the Laboratory Kit (see "required materials" are required to complete the course. **We expect this kit to remain under $35**.
- **Access to a freezer –** You will need to freeze water and/or salt water for some experiments. You will also need access to ice cubes (~half a standard tray). The shelf space equivalent to a gallon ice cream container, usually for no more than 12 hours in a week, should be more than enough to complete all experiments – we are working to bring requirements down to a 4"x4"x4" size.
- **Access to a microwave** – You will need to heat water and other food-safe items (flour, corn starch) for experiments in this course. Experiments can be adapted to hot plate, stove, oven, etc if needed; contact the instructor if alternate instructions are required.
- **WORKING SURFACE** such as a desk or table that is safe for use with typical kitchen acids and bases (think vinegar or lemon juice), and that will be safe in case of a water spill. We recommend _not_ working right in front of your laptop!

Required Equipment

- **Computer:** current Mac (MacOS) or PC (Windows 10) with high-speed internet connection
- **Webcam:** built-in or external webcam, fully installed and tested
- **Microphone:** built-in laptop or tablet mic or external microphone
- **Other:** a mobile device (smartphone or tablet) to use for BuckeyePass authentication
- **Cell phone camera or equivalent** (tablet; portable camera; etc) sufficient to document experiential work

If you do not have access to the technology you need to succeed in this class, review options for technology and internet access at go.osu.edu/student-tech-access.

Required Software

Microsoft Office 365: All Ohio State students are now eligible for free Microsoft Office 365. Visit the installing Office 365 (go.osu.edu/office365help) help article for full instructions.

HTML5 capable browser: Any web browser that supports HTML5 (ie: most modern browsers, including Safari on an iPad with updated system software) can run the PhET simulations from the website. The full list of compatible systems and browsers can be found here: https://phet.colorado.edu/en/help-center/running-sims

CarmenCanvas Access

You will need to use BuckeyePass (buckeyepass.osu.edu) multi-factor authentication to access your courses in Carmen. To ensure that you are able to connect to Carmen at all times, it is recommended that you do each of the following:

- Register multiple devices in case something happens to your primary device. Visit the BuckeyePass - Adding a Device (go.osu.edu/add-device) help article for step-by-step instructions.
- Request passcodes to keep as a backup authentication option. When you see the Duo login screen on your computer, click **Enter a Passcode** and then click the **Text me new codes** button that appears. This will text you ten passcodes good for 365 days that can each be used once.
- Install the Duo Mobile application (go.osu.edu/install-duo) on all of your registered devices for the ability to generate one-time codes in the event that you lose cell, data, or Wi-Fi service.

If none of these options will meet the needs of your situation, you can contact the IT Service Desk at 614-688-4357 (HELP) and IT support staff will work out a solution with you.

Technology Skills Needed for This Course

- Basic computer and web-browsing skills
- Navigating CarmenCanvas (go.osu.edu/canvasstudent)
- CarmenZoom virtual meetings (go.osu.edu/zoom-meetings)
- Recording a slide presentation with audio narration and recording, editing and uploading video (go.osu.edu/video-assignment-guide)
- **TOP HAT registration:** We will use the TopHat (www.tophat.com) classroom response system in some of our Tuesday synchronous sessions to allow students to become active participants. You will be able to submit answers to in- class questions using Apple or Android smartphones and tablets, laptops, or through text message. You can visit this guide for Getting Started for Students, which outlines how you will register for a Top Hat account, as well as providing a brief overview to get you up and running on the system. An email invitation will also be sent to your school email account (if you don't receive this email, you can register by visiting our course Carmen page and using the link).
- We will be using several interactive educational simulations (PhETs) collected at the University of Colorado, Boulder. You can find their privacy policy at https://phet.colorado.edu/en/privacy-policy

Technology Support

For help with your password, university email, CarmenCanvas, or any other technology issues, questions or requests, contact the IT Service Desk, which offers 24-hour support, seven days a week.

- **Self Service and Chat**: go.osu.edu/it
- **Phone:** 614-688-4357 (HELP)
- **Email:** servicedesk@osu.edu

Grading and Faculty Response

How Your Grade is Calculated

Assignment Category	Points
Weekly Module Grade The precise point split will vary by module and will be detailed each week in the Module Overview, but we will use the following *approximate* guideline. - 5% TopHat - 10% Reading Quiz - 40% Assignment - 35% Experiential/Lab Report	70%, divided evenly over the 13 modules. Using modules rather than assignment type as our grade divisions allows us to be flexible within each module, while still giving you predictable and consistent feedback on your progress.
Intermediate Exams	30%, divided evenly over 4 exams
Final Exam	None, but Intermediate Exam 4 will be carried out during our scheduled Final Exam period
Total	100%

See Course Schedule for due dates.

Descriptions of Major Course Assignments

Syllabus and Academic Misconduct (COAM) Quiz 0

Description: The mandatory Syllabus, course policies, and COAM quiz on Carmen (Quiz 0) must be completed by the **Module 1 Intermediate Deadline** (Saturday 11:59 PM, first week of classes). Completing this quiz will also be used as the measure of your participation in this class for Federal Title IV reporting; this deadline allows us to complete these reporting requirements. **If you miss the deadline for any reason, contact the instructor immediately** to discuss an extension**!** Unless you receive 100% on this quiz, ***you will not receive a passing grade in this course*** (instead, an E will be submitted as your final grade). However, you may take the quiz as many times as you need to receive the requisite score.

Reading Quizzes

Description: Each module will have a textbook reading quiz that will be administered as a Mastery/My-Lab quiz. While most will be multiple choice, there are some embedded tutorial activities that will walk you through textbook concepts, and some weeks will have embedded FLaReS Critical Thinking exercises, which will be introduced in Module 1. We recommend completing the reading and associated quiz by Saturday, but we are leaving the online due date open until Tuesday at 11:59 PM to allow for student flexibility.

Academic integrity and collaboration: You are welcome to discuss the content of the reading quizzes with classmates, or complete them alongside a classmate, but be certain that you understand your answers

Assignments:

Description: Three major assignment formats will be used. Each module will include one of these assignment types (ie: one assignment per week). Full assignment details will be available on Carmen, posted with each module.

- **Discussions:**
  Some modules may use group discussions as a primary engagement component. Students will be asked to research and write posts on selected prompts or topics by the Intermediate Deadline. Students will then be asked to follow up to at least 3 classmates' prompts with comments that engage directly with the content of their post by the End of Week Deadline. A clear rubric for grading the post and responses will be included with the assignment description.
- **Problem Sets**:
  Some modules will use traditional homework problems as the primary form of assessment and engagement. These are especially helpful for units with structures and calculations. Students should expect some of these problems to cover both theoretical concepts and practical applications of chemistry.
- **Mini-Projects:**
  Some modules will ask students to engage with the topic in a creative way. In past semesters, these have included a travel advisory focused on water quality for a U.S. City (Module 7) or an informational poster about the chemistry of a favorite personal care product (Module 11). These mini-projects are all intended to be completed within that module week. The full details of each mini-project will be posted on Carmen, including academic integrity and collaboration guidelines, and a clear grading rubric.

Academic integrity and collaboration: You should not use generative AI in the preparation of any of your written work for submission. This is true for discussion posts, responses, problem set responses, or any mini-projects. You are welcome to talk over your work with a classmate or trusted person, but the work you submit should be your own. Please see the Carmen description of the assignment for any special considerations relevant to a specific assignment.

Lab Report

Description: In the laboratory/experiential learning component, students will employ the processes of science to interact directly with the natural world using appropriate tools, models, and data analysis as accessible in a distance learning environment. This should average to 3 hours of work per week, and will be assessed through the Lab Report. We use the term “Lab Report” to mean any ways that students are graded for this work; for some weeks, this may include credit for data submission (For example, via Microsoft365) or contributing to a Group Discussion on Carmen, or a more traditional laboratory report submitted through Carmen.

You will be expected to document physical at-home work through photos of your experimental setup or results, as well as carrying out analysis or answering questions/prompts as appropriate per week. You will be graded on your engagement with process of science, rather than your “success” – sincere reflection and failure analysis can still get you full points even if a physical experiment does not provide the expected outcomes.

Academic integrity and collaboration: You should complete your own experiments. If you have a friend in the class, you can do the work side by side – but you should have your own setup. Similarly, you are welcome to talk over the content of the worksheet/report with classmates, but the work you submit should be your own.

Intermediate Exams

Description: There will be 4 intermediate exams throughout the semester. While each exam will be focused on a subset of modules, material from earlier modules that provides foundational knowledge will be naturally incorporated in later exams. These exams will be 1 hour, timed, and administered through Carmen. They will typically be a combination of multiple choice, multiple select, and short essay questions. In the workload calculation for each week, the instructor will include the time required to prepare for and/or take Intermediate Exams 1-3, which will be available during a Friday – Tuesday testing window. Intermediate Exam 4 will be taken during our scheduled Final Exam period according to the university schedule.

Academic integrity and collaboration: These exams should be completed independently and represent your own work. You should not discuss the content of these exams with anyone.

Late Assignments

Due dates are set to help you stay on pace and to allow timely feedback that will help you complete subsequent assignments. The Intermediate Deadline (Saturday 11:59 PM) is only used when your classmates are depending on you to have your work available for collaboration! Because of this, extensions will not be readily granted. You are intended to complete all work in a module by Monday 11:59 PM, before the new module starts on Tuesday. However, we will accept assignments on Carmen until Tuesday at 11:59 PM. Because we are already building in the flexibility of a 24 hour late period, we do not intend to accept any late work past this Tuesday deadline. If you have highly unusual, unpredictable,

and urgent extenuating circumstances, do contact your instructor – but we expect this to be rare.

Group Work:

In week 1, students will be randomly assigned to a discussion group that will persist through the semester. These groups will serve as your cohort for future Discussions, to keep the discussion group size relatively small. While students will be interacting with each others' posts and data at a cohort level, all work will be graded on an individual basis. If there is an irreconcilable problem with your group placement, please contact the instructor..

Instructor Feedback and Response Time

I am providing the following list to give you an idea of my intended availability throughout the course. Remember that you can call 614-688-4357 (HELP) at any time if you have a technical problem.

- **Preferred contact method:** If you have a question, please contact me first through the Carmen Portal, which will send email to my Ohio State email address. I will do my best to reply to emails within **48 hours on days when class is in session at the university**, although I will strive for a 24 hour response. If you do not receive a response within 48 hours, please resend your message!
- **Class announcements:** I will send all important class-wide messages through the Announcements tool in CarmenCanvas. Please check your notification preferences (go.osu.edu/canvas-notifications) to ensure you receive these messages.
- **Discussion board:** I will check and reply to messages in the discussion boards once mid-week and once at the end of the week on weeks that we have scheduled discussions.
- **Grading and feedback:** For assignments submitted before the due date, I will try to provide feedback and grades within **seven days**. Assignments submitted after the due date, even for an excused absence, may have reduced feedback, and grades may take longer to be posted.

Grading Scale

The grades in this1000-level chemistry courses are assigned by your instructor in consultation with the Vice Chair of Undergraduate Studies. The following grading scale will be used as a starting point to determine your final grade. No extra credit and no grade rounding should be expected in this course once assignments and exams are complete.

93–100: A
90–92.9: A-
87–89.9: B+
83–86.9: B

80–82.9: B-
77–79.9: C+
73–76.9: C
70–72.9: C-
67–69.9: D+
60–66.9: D
Below 60: E

Other Course Policies

Synchronous Zoom Communication Guidelines

- **Technical Issues:** If you encounter a technical issue with Zoom during a session, first make sure you are using the latest version of Zoom. Next, contact the IT Service Desk at go.osu.edu/it or 614-688-4357(HELP). If issues continue, contact me after the session to learn how to make up for the missed content either via a recording or other means. I will not be able to address technical issues during a live session.
- **Preparation:** Come to the session ready to have open, civil, and supportive discussions in video and chat spaces. I ask that you update your Zoom profile with your preferred name (and your name.# if your preferred name does not match your Carmen name) and add a picture with your face.
- **Participation:** At the start of our sessions, I will share specific expectations for how to use the chat, how to interact, and how to raise questions or concerns as we go. If you are unsure about expectations or are unsure about raising a question, please follow up with me afterward to make sure your questions are answered. Plan to be present during the entire class session as much as you are able. For some activities, I may ask you to share your faces on camera so that we can see each other and connect. For example, when in breakout rooms or other small-group discussions, having cameras on as often as possible will help you get the most out of activities. Please feel encouraged to use a non-distracting virtual background. Many students and instructors prefer not to share their remote spaces for a variety of reasons. Mute your microphone when others are talking to minimize background noise in the meeting.
- **Security:** The course zoom sessions will require that you are logged into CarmenZoom with your OSU credentials for secure access. This helps protect your privacy, and that of your classmates.
- **Recordings:** This course uses video and audio recordings of our synchronous zoom sessions. These recordings are available to all students presently enrolled in the course. Please note that you are not allowed to share these recordings. This is to protect your FERPA rights and those of your fellow students.

If you have any concerns about participating in class over Zoom in this way, please let me know. My goal is to create a safe environment where we can benefit from seeing each other and connecting, but I want to prioritize your safety and well-being.

Discussion and Communication Guidelines

The following are my expectations for how we should communicate as a class. Above all, please remember to be respectful and thoughtful.

- **Writing style**: While there is no need to participate in class discussions as if you were writing a research paper, you should remember to write using good grammar, spelling, and punctuation. A more conversational tone is fine for non-academic topics.
- **Tone and civility**: Let's maintain a supportive learning community where everyone feels safe and where people can disagree amicably. Remember that sarcasm doesn't always come across online. I will provide specific guidance for discussions on controversial or personal topics.
- **Citing your sources**: When we have academic discussions, please cite your sources to back up what you say. For the textbook or other course materials, list at least the title and page numbers. For online sources, include a link.
- **Backing up your work**: Consider composing your academic posts in a word processor, where you can save your work, and then copying into the Carmen discussion.
- **Synchronous sessions**: During our Zoom sessions I ask you to include preferred name, and your name.# if your preferred name is different than your Carmen name, and a clear photo of your face in your Carmen profile. During our full-group lecture time, you may turn your camera off if you choose. When in breakout rooms or other small-group discussions, having cameras and mics on as often as possible will help you get the most out of activities. You are always welcome to use the free, Ohio State-themed virtual backgrounds (go.osu.edu/zoom-backgrounds). Remember that Zoom and the Zoom chat are our classroom space where respectful interactions are expected.

Academic policies

Academic integrity policy

See **Descriptions of major course assignments**, above, and the Carmen page for each assignment for my specific guidelines about collaboration and academic integrity in the context of this online class.

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term “academic misconduct” includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct: http://studentlife.osu.edu/csc/.

If I suspect that a student has committed academic misconduct in this course, I am obligated by university rules to report my suspicions to the Committee on Academic Misconduct. If COAM determines that you have violated the university’s Code of Student Conduct (i.e., committed academic misconduct), the sanctions for the misconduct could include a failing grade in this course and suspension or dismissal from the university.

If you have any questions about the above policy or what constitutes academic misconduct in this course, please contact me.

Other sources of information on academic misconduct (integrity) to which you can refer include:

- Committee on Academic Misconduct web page (go.osu.edu/coam)
- Ten Suggestions for Preserving Academic Integrity (go.osu.edu/ten-suggestions)

Copyright for instructional materials

The materials used in connection with this course may be subject to copyright protection and are only for the use of students officially enrolled in the course for the educational purposes associated with the course. Copyright law must be considered before copying, retaining, or disseminating materials outside of the course.

Statement on title IX

Title IX makes it clear that violence and harassment based on sex and gender are Civil Rights offenses subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories (e.g., race). If you or someone you know has been sexually harassed or assaulted, you may find the appropriate resources at http://titleix.osu.edu or by contacting the Ohio State Title IX Coordinator at titleix@osu.edu

Commitment to a diverse and inclusive learning environment

The Ohio State University affirms the importance and value of diversity in the student body. Our programs and curricula reflect our multicultural society and global economy and seek to provide opportunities for students to learn more about persons who are different from them. We are committed to maintaining a community that recognizes and values the inherent worth and dignity of every person; fosters sensitivity, understanding, and mutual respect among each member of our community; and encourages each individual to strive to reach his or her own potential. Discrimination against any individual based upon protected status, which is defined as age, color, disability, gender identity or expression, national origin, race, religion, sex, sexual orientation, or veteran status, is prohibited.

Land acknowledgement

We would like to acknowledge the land that The Ohio State University occupies is the ancestral and contemporary territory of the Shawnee, Potawatomi, Delaware, Miami, Peoria, Seneca, Wyandotte, Ojibwe and Cherokee peoples. Specifically, the university resides on land ceded in the 1795 Treaty of Greeneville and the forced removal of tribes through the Indian Removal Act of 1830. I/We want to honor the resiliency of these tribal nations and recognize the historical contexts that has and continues to affect the Indigenous peoples of this land. More information on OSU's land acknowledgement can be found here: https://mcc.osu.edu/about-us/land-acknowledgement

Your mental health

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing. If you or someone you know are suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services available on campus via the Office of Student Life's Counseling and Consultation Service (CCS) by visiting ccs.osu.edu or calling 614-292-5766. CCS is located on the 4th Floor of the Younkin Success Center and 10th Floor of Lincoln Tower. You can reach an on-call counselor when CCS is closed at 614-292-5766 and 24 hour emergency help is also available 24/7 by dialing 988 to reach the Suicide and Crisis Lifeline.

Religious accommodations

It is Ohio State's policy to reasonably accommodate the sincerely held religious beliefs and practices of all students. The policy permits a student to be absent for up to three days each academic semester for reasons of faith or religious or spiritual belief.

Students planning to use religious beliefs or practices accommodations for course requirements must inform the instructor in writing no later than 14 days after the course begins. The instructor is then responsible for scheduling an alternative time and date for the course requirement, which may be before or after the original time and date of the course requirement. These alternative accommodations will remain confidential. It is the student's responsibility to ensure that all course assignments are completed.

Accessibility accommodations for students with disabilities

Requesting accommodations

The university strives to maintain a healthy and accessible environment to support student learning in and out of the classroom. If you anticipate or experience academic barriers based on your disability (including mental health, chronic, or temporary medical conditions), please let me know immediately so that we can privately

discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion.

If you are isolating while waiting for a COVID-19 test result, please let me know immediately. Those testing positive for COVID-19 should refer to the Safe and Healthy Buckeyes site for resources. Beyond five days of the required COVID-19 isolation period, I may rely on Student Life Disability Services to establish further reasonable accommodations. You can connect with them at slds@osu.edu; 614-292-3307; or slds.osu.edu.

Accessibility of Course Technology

This online course requires use of CarmenCanvas (Ohio State's learning management system) and other online communication and multimedia tools. If you need additional services to use these technologies, please request accommodations as early as possible.

- CarmenCanvas accessibility (go.osu.edu/canvas-accessibility)
- Streaming audio and video
- CarmenZoom accessibility (go.osu.edu/zoom-accessibility)

Course Schedule

Refer to the CarmenCanvas course for up-to-date due dates, which will be posted in the Module Overview for each module. The textbook sections for each week will be compiled into a single simple “scheduled reading” assignment that can be found on Carmen.

Module	Topic	LECTURE Topics	READING	Engaging in Science	Major Graded Work
1	Welcome	What is Chemistry? Critical thinking to evaluate scientific claims	Chapter 1	Introduction to at home laboratory Pick up lab kit, validate access to appropriate space to complete at-home lab work including freezer access and microwave or stove.	Syllabus Quiz (policies) Module 1 Reading Quiz Module 1 Assignment – introduction! Module 1 Lab Report
2	Introductory Chemistry	Introductory Chemistry (names, notations, formulas, molecular representations)	Chapter 4	Carbon Dioxide 1: “Natural” or “Chemical”? Capturing carbon dioxide from household sources	Module 2 Reading Quiz Module 2 Assignment Module 2 Lab Report
3	Radium and Radon	Atomic structure, nuclear reactions, ionizing v. nonionizing radiation. Introduce at-home radon tests	Ch 3.3-3.5, Ch 11	Working with Data Sets: Ohio Dept of Health Radon Statistics database and maps https://odh.ohio.gov/know-our-programs/radon-education-and-licensing-program/Radon-Data	Module 3 Reading Quiz Module 3 Assignment Module 3 Lab Report
4	Ozone: gasses in the atmosphere	Chemical reactions, equations, balancing	Ch 5.1-3, Ch 8.5, Ch 13.8	Making and calibrating a bottle thermometer *Save to use in Module 5*	Module 4 Reading Quiz Module 4 Assignment Module 4 Lab Report Intermediate Exam 1

5	Ozone: Greenhouse gasses	Balancing chemical equations, natural gas laws	Chapter 6, Ch 13.9-10	Chapter 6 Let's Experiment: Natural gas laws, and gas expansion in a balloon reactor *Use kit thermometer as a backup for your Module 4 bottle thermometer if needed*	Module 5 Reading Quiz Module 5 Assignment Module 5 Lab Report
6	Properties of Lead	Solution formation and equations continued, electrolytes. Early uses in society, Baltimore Lead Paint Study	Ch 5.5 Ch 6.1-6.4, Ch 14.1	Solutions 1 – Limits of solubility. PhET simulation coupled to at-home experimental work	Module 6 Reading Quiz Module 6 Assignment Module 6 Lab Report
7	Lead and our Water Supply	Solids, ions in aqueous solutions, precipitation reactions. Flint / Benton Harbor MI	Chapter 14	Solutions 2 – Serial dilutions, concentrations, and limits of detection. Expansion on Chapter 14: Let's Experiment	Module 7 Reading Quiz Module 7 Assignment Module 7 Lab Report Intermediate Exam 2
8	Carbon Dioxide	Acid-base reactions of carbon dioxide and the bicarbonate buffering system in the kitchen, the environment, and our bodies	Chapter 7	Carbon Dioxide 2: Understanding the acidity of common materials through reaction with sodium bicarbonate. While reagents will be provided in the kit, students are welcome to test their own as well. *Students who can provide their own ingredients can substitute microwave mug cakes as an experimental system; see Carmen for details and use alternate experiential report sheet*	Module 8 Reading Quiz Module 8 Assignment Module 9 Lab Report
9	Community Chemicals – road salt	Phase changes and colligative properties Making choices as a community: balancing effectiveness, cost, and environmental impact in winter road treatments	No new textbook. Review: Ch 6.3-6.4, Ch 14.1-14.3 Online supplemental	Sweet and Salty Road Deicers Part 1: Ice melt measurements with brine and solid salt. Share results via Microsoft 365 Forms and Carmen Discussion forum for **Intermediate Deadline**. Carmen discussion group: assess reproducibility of at-home melt test results within your group. **(EOM deadline)**	Module 9 Reading Quiz Module 9 Assignment Module 9 Lab Report (split over Intermediate and End of Module Deadlines)

			reading on Carmen.	Looking Forward: Please note that the requirements of your Module 11 winter treatment plan are posted with this module, to help you plan ahead!	
10	Household Chemicals I	Household care products: Detergents, soaps, and cleaners; surfactants, lipids, and intermolecular forces	Ch16.4-16.5, 20.1-20.5	Sweet or Salty Road Deicers: Real World Testing and Community Choices. Group read with social annotation: https://www.dot.state.mn.us/research/reports/2017/201745.pdf Each group will be assigned one section of this extended report of "real world" road tests, and break down the experimental design, results, and analysis. Intermediate Deadline: In-group social annotation phase End of Week Deadline: Comment on 2 annotations from other groups	Module 10 Reading Quiz Module 10 Assignment Module 10 Lab Report (assessed on social annotation participation and quality) Intermediate Exam 3
11	Household Chemicals II	Personal care products: The proteins of in our skin, hair, and the chemicals we treat them with.	Ch16.6-16.7; chapter 20.6	Finalize your individual plan for winter treatment of OSU (or another midwestern/northern location) sidewalks and roads Mini-experiment: Effect of water on lathering in hand soap, shampoo, or toothpaste	Module 11 Reading Quiz Module 11 Assignment Module 11 Lab Report
12	Sugar and Carbohydrates	Carbohydrates: simple sugars, sucrose, starch History of sugar: Industrialization and human impact in the isolation of sucrose from sugar cane, sugar beets, and corn.	Chapter 16.1-16.3 Online supplemental reading on Carmen – student choice	Molecular basis for starches and proteins as thickening agents. Kit laboratory: making paste and glue from corn starch and flour, and assessing them through adhesive strength tests (EOM) *Optional edible laboratory for students who provide their own ingredients: thickening agents in pies, custards, and puddings.*	Module 12 Reading Quiz Module 12 Assignment Module 12 Lab Report

13	Sugar and Carbohydrates	Glucose as energy: biological metabolism and alternative fuel sources	CH 15.1-15.5, 15.10	What's in that sugar? Yeast growth and respiration on commercial sweeteners assessed through carbon dioxide production Intermediate deadline: Complete initial yeast growth assays, with documentation on Carmen Discussion Group and results submission on Microsoft365 Forms. End-of-module Deadline: Data analysis and Experiential Report	Module 13 Reading Quiz Module 13 Assignment Module 13 Lab Report Intermediate Exam 4 will be completed during final exam week according to the University Final Exam Schedule

Sample plans for selected CHEM 1100 distance laboratories. Note: these are not the documents as they will be released to students, and are not the final lesson plans; these are our initial plans (pending final testing and laboratory kit development) included to give a sense of how we are asking students to engage in the practice of science.

Module 9, Sweet and Salty Road Deicers Part 1

In lecture this week, we have been talking about colligative properties such as freezing point depression. Over the next few weeks, we will be working with the application of colligative properties in the "real world" through the lens of treatments that communities use to keep their roads and sidewalks clear of snow and ice in the winter months – and the challenges to doing so!

This first week, you will be carrying out your own tests of the ice-melting capabilities of different treatments. Our goal here is two-fold. First, to connect the concepts we discussed in lecture connect to the physical world in the controlled environment of a "benchtop experiment". Second: Each student has been provided identical resources to carry out your melting experiments and to measure your results. By comparing these results across your group and the class, you should gain a sense of how we determine whether results are reproducible across multiple trials, and gain some familiarity with simple statistical measures.

Grade:
You will be submitting the following.
Worksheet:
Download the Experiential Report worksheet. As you go through the experiment, fill it out, including inserting any required photos! This will save you time at the end.

Before Lab:
You will have two potential deicing chemicals to test. One is sodium chloride (NaCl; same chemical as rock salt), and the other is sucrose (sugar) as an analog for "agricultural byproduct" sugars that are used commercially. You will be making equivalent weight/volume solutions of the two chemicals.

Worksheet Predict: Which deicer, A or B would you predict will work better (ie: melt a larger volume of water)? Why?
Worksheet Design: Why is **Container A** (no deicer) an important part of this setup?

Worksheet Connect: Over the past few decades, many communities have moved from using solid deicers dropped on the road, to using liquid deicers that spray liquid over the surface. How well do the experimental designs you are working with correspond to these two different types of application?

Connect: Communities use both sugar-based and salt-based deicing products. On your homework this week, we will be asking you to discuss environmental and infrastructure costs

and benefits to sugar-based, NaCl-based, and alternate de-icers. This might be a good time to look at the Community Decision reading!

Timeline:
Step 1: ~20-30 minutes
Take 4 freezing containers and add a layer of water into the bottom of each (**note: determining whether these will be student-supplied plastic take-out containers or disposable petri dishes, pending kit contents. This will impact reproducibility…)** Stack these in the freezer for at least 6 hours, until frozen. Do not remove them until you are ready to test! Time allotted: 10 minutes.

Add water to each of your "Freezing Reagent" tubes **(note: we imagine supplying these as measured solids in a falcon tube labeled 9A and 9B; 9A will be NaCl for brine, 9B will be sucrose/sugar)** to bring it to the 40 mL marking. Put the lid back on, and mix until the solid is dissolved. Add more water to bring the final volume up to 45 mL, and mix again.

Take a paper square from your kit. Roll it loosely, and insert it into Freezing Reagent Tube 9A. Allow it to soak for 5 minutes, then remove it and set it on [some kind of plastic working space such as an extra petri dish lid, details tbd; something that won't absorb].

Take two more paper squares. Roll each loosely, put one into Freezing Reagent Tube 9A, and one into Freezing Reagent Tube 9B. Screw the lids back on, and leave these until you are ready for **Step 2.**

Step 2: ~30-45 minutes
Get your squares ready! Pour off the solution in your wet tubes. You will need to watch the time for the following: Move your 4 freezing containers to your work space. **WORKSHEET:** Record how long it takes to get from the freezer to your workspace and place your first square onto the surface (in minutes).

Container A: Add nothing to this.
Container B: Place the **9a-dried** square on the surface of the ice.
Container C: Place the **9a-wet** square on the surface of the ice.
Container D: Place the **9b-wet** square on the surface of the ice.

You have 4 "measurement" tubes labeled A-D for this experiment.
At 5 minutes: pour any liquid from each container into the matching measurement tube.
WORKSHEET: Record the volumes in the appropriate places.
At 10 minutes: pour any additional liquid from each container into the matching measurement tube and record the new volume.
WORKSHEET: Record the volumes in the appropriate places.
Take a picture of your setup, and insert into the appropriate place on the worksheet.

Go to [we've been informed we can't use Google Forms due to FERPA; adjusting on the fly. Microsoft 365 has an alternate pathway we're exploring] and fill out the survey with your results.

Worksheet Intermediate analysis:

1) Given your results, which tube do you think contained sugar, and which tube contained salt? What evidence do you base this off of?
2) What differences did you notice between the dry and the wet 9A melts? Why do you think these differences occurred?

COMPLETE THROUGH THIS STEP BEFORE THE INTERMEDIATE DEADLINE!

PART 2 Group Analysis: ~2 hrs

OPEN the spreadsheet in Microsoft Excel.
For each of the 8 data sets, find the **minimum value** recorded, **maximum value** recorded, the **mean**, and the **median**. Enter these values in the appropriate boxes in your worksheet.

Using just these values, which condition do you think is "best" to melt snow that has fallen on a sidewalk? Explain.

NOTE: This will need to be flexible! Predictable sources of error in experimental design
We expect that "wet melt" results will be similar across all students, but that "dry melt" will be different based on the time that it takes to get their ice from the freezer to their desk and add the squares (ie: if the surface is still truly dry) We will be simulating this over the summer. In the autumn, we will run our own analysis quickly and look for interesting variations, then use this to guide the questions we release in Worksheet Part 2 (everything on the community analysis section).

For the data set labeled 9A-wet-5min,
How would you present this data graphically to an audience if your goal was to help them understand the variation in experiments across the class? Choose from Column, x-y scatter, box-and-whisker, and pie chart. Screenshot your chart, and explain your choice.

For the data set labeled 9A-dry-5min, 9A-wet-10 nin, 9A-dry-10min
Use the method you chose above to graph out these data sets. How much does the variation change across these data points?

Graph as x-y scatter plot the time it took each student to move from freezer to bench against the "9A-dry-5min" melting values. What do you observe, and how would you explain your observation?

IF you were to redesign this set of experiments to minimize this source of error, how could you do so? What other errors might you introduce in your new procedure?

This would be submitted as experiential report.

Extra credit opportunity:
Students can follow through a condition 5 that is a material of their own choice as a potential deicer. Students will have been introduced to the Wisconsin cheese brine, New Jersey pickle brine, Ohio beet juice, and Iowa corn byproducts as unusual deicing products in lecture. A student who evaluates the deicing potential of another material from their environment, documents it in their worksheet, and evaluates it compared to NaCl, can earn up to 5% extra credit on this activity. While these will not be included in community analysis, we will share a list of the individual results/conclusions with the class (filtered for appropriate choices).

Distance Approval Cover Sheet

For Permanent DL/DH Approval | College of Arts and Sciences

Course Number and Title: Chem 1100: Chemistry & Society

Carmen Use

When building your course, we recommend using the ASC Distance Learning Course Template for CarmenCanvas. For more on use of Carmen: Common Sense Best Practices.

☑ A Carmen site will be created for the course, including a syllabus and gradebook at minimum.

If no, why not?

Full Carmen site with common module templates, assignment templates, etc to maintain continuity for students throughout the semester. We will use the existing templates designed for Chem 1100 in past years as a model.

Syllabus

☑ Proposed syllabus uses the ASC distance learning syllabus template, includes boilerplate language where required, as well as a clear description of the technical and academic support services offered, and how learners can obtain them.

☑ Syllabus is consistent and is easy to understand from the student perspective.

☑ Syllabus includes a schedule with dates and/or a description of what constitutes the beginning an end of a week or module.

☑ If there are required synchronous sessions, the syllabus clearly states when they will happen and how to access them.

Additional comments (optional):

Significant organization and communication will also occur through the Carmen site for students enrolled in the course; the broad framework is provided in the syllabus, but variation is expected week-to-week, and will be laid out very specifically within each module in the Module Overview page.

Instructor Presence

For more on instructor presence: About Online Instructor Presence.

Students should have opportunities for regular and substantive academic interactions with the course instructor. Some ways to achieve this objective:

☑ Regular instructor communications with the class via announcements or weekly check-ins.

☑ Instructional content, such as video, audio, or interactive lessons, that is visibly created or mediated by the instructor.

☑ Regular participation in class discussion, such as in Carmen discussions or synchronous sessions.

☑ Regular opportunities for students to receive personal instructor feedback on assignments.

Please comment on this dimension of the proposed course (or select/explain methods above):

There is one synchronous class session per week to bring the group together as a coherent group, and to provide opportunities for students to make connections/communicate (through breakout room activities) with each other and with the instructor in real time.
There will be additional faculty-recorded video lectures (broken into shorter topic-specific chunks) that add up to ~1 hour per week.
In approximately half the weeks, there will be Carmen discussions associated with either the lecture or the experiential class component
Instructors will provide personal feedback on the weekly assignment. The assignments are also developed by the instructor to help students walk through the learning outcomes for the week.

Delivery Well-Suited to DL/DH Environment

Technology questions adapted from the Quality Matters rubric. For information about Ohio State learning technologies: Toolsets.

☑ The tools used in the course support the learning outcomes and competencies.

☑ Course tools promote learner engagement and active learning.

☑ Technologies required in the course are current and readily obtainable.

☑ Links are provided to privacy policies for all external tools required in the course.

Additional technology comments (optional):

Link is provided to the PhET simulation site privacy policy (phet.colorado.edu)

Which components of this course are planned for synchronous delivery and which for asynchronous delivery? (For DH, address what is planned for in-person meetings as well.)

Synchronous: 1 hour per week of class time, to be used as appropriate for the course
Asynchronous: Recorded faculty videos, curated additional video content or online activities, textbook reading or additional supplemental selected readings, reading quizzes, weekly assignments, weekly lab and report

If you believe further explanation would be helpful, please comment on how course activities have been adjusted for distance learning (optional):

We've worked hard to develop lab experiences that can safely be carried out in an apartment or dorm room but still allow hands-on engagement with the processes of science in safe and affordable way. This is probably the most challenging component to deliver at a distance. We will have a GTA available for at least 4 (up to 6) hours on Thursday and Friday each week for support.

Workload Estimation

For more information about calculating online instruction time: ODEE Credit Hour Estimation.

☑ Course credit hours align with estimated average weekly time to complete the course successfully.

☑ Course includes direct (equivalent of "in-class") and indirect (equivalent of "out-of-class)" instruction at a ratio of about 1:2.

Provide a brief outline of a typical course week, categorizing course activities and estimating the approximate time to complete them or participate:

Each week will vary slightly, but in one typical week a student might spend::
3 hours laboratory learning, cleanup, laboratory report, and submission
3 hours Traditional direct: 10 minutes on module overview and introduction; 1 hour synchronous class; 1 hour asynchronous faculty lecture videos; 30-45 min curated videos or lecture-linked online simulations, or supplemental "more depth" readings
6 hours mixed direct/indirect or traditional indirect:
3 hours for the Weekly Assignment (asking students to critically engage with foundational concepts as well as connections of chemistry to life, society, and/or environment in a variety of formats)
1.5 hours textbook reading (for a typical 30 page chapter, read to understand with new concepts) paired with .5 hours Mastery reading assignment
1 hour open study time - for example, review of prior week assignment/feedback; optional online tutorials at the textbook site; review and studying towards the next Intermediate Exam

☐ In the case of course delivery change requests, the course demonstrates comparable rigor in meeting course learning outcomes.

Accessibility

For more information or a further conversation, contact the accessibility coordinator for the College of Arts and Sciences. For tools and training on accessibility: Digital Accessibility Services.

☑ Instructor(s) teaching the course will have taken Digital Accessibility training (starting in 2022) and will ensure all course materials and activities meet requirements for diverse learners, including alternate means of accessing course materials when appropriate.

☑ Information is provided about the accessibility of all technologies required in the course. All third-party tools (tools without campus-wide license agreements) have their accessibility statements included.

Description of any anticipated accommodation requests and how they have been/will be addressed.

The course was previously delivered online with "grandfathered" online delivery permission. We have not previously had any accommodation requests regarding accessibility of online technologies that we use in this course. We do receive accommodation requests mediated by SLDS; we work with SLDS to accomodate all students.
If any accomodations are requested regarding the laboratory learning component, we will work with the excellent staff in the Undergraduate Chemistry Office with extensive experience in the general chemistry laboratory context to develop appropriate accomodations.

Additional comments (optional):

Academic Integrity

For more information: Academic Integrity.

☑ The course syllabus includes online-specific policies about academic integrity, including specific parameters for each major assignment:

☑ Assignments are designed to deter cheating and plagiarism and/or course technologies such as online proctoring or plagiarism check or other strategies are in place to deter cheating.

Additional comments (optional):

Brief academic integrity information is included in the syllabus for each assignment type; there is also an academic integrity and collaboration statement in our template for the weekly assignments, which we customize to fit the details of each assignment on Carmen.

Frequent, Varied Assignments/Assessments

For more information: *Designing Assessments for Students*.

Student success in online courses is maximized when there are frequent, varied learning activities. Possible approaches:

☑ Opportunities for students to receive course information through a variety of different sources, including indirect sources, such as textbooks and lectures, and direct sources, such as scholarly resources and field observation.

☑ Variety of assignment formats to provide students with multiple means of demonstrating learning.

☑ Opportunities for students to apply course knowledge and skills to authentic, real-world tasks in assignments.

Comment briefly on the frequency and variety of assignment types and assessment approaches used in this course (or select methods above):

Each module we use at least 4 assignment types and assessment approaches (TopHat engagement questions, formative reading Mastery quizzes, major weekly assignment that varies in type from week to week, Lab Report).
We also have 4 summative exams spread over the semester to provide rapid feedback.

We use the Module 1 introduction discussion to survey student interests, and then work them into the course throughout the semester. We ask students regularly to bring real-world scenarios, experiences, and tasks into our assignments - the driving idea behind the course is to help students understand the chemistry that underlies their every day experiences as well as the impacts on their society and environment.

Community Building

For more information: Student Interaction Online.

Students engage more fully in courses when they have an opportunity to interact with their peers and feel they are part of a community of learners. Possible approaches:

- [x] Opportunities for students to interact academically with classmates through regular class discussion or group assignments.
- [x] Opportunities for students to interact socially with classmates, such as through video conference sessions or a course Q&A forum.
- [x] Attention is paid to other ways to minimize transactional distance (psychological and communicative gaps between students and their peers, instructor, course content, and institution).

Please comment on this dimension of the proposed course (or select methods above):

We are holding one synchronous section per week precisely to help fulfill this objective; we found that in a fully asynchronous delivery mode in prior years, it was challenging to help students overcome the “chemistry barrier” to engage fully in our course objectives, to enage with their instructor, and to engage with each other.

Scaffolded opportunities for direct interaction include break-out rooms in the synchronous session, and discussion forum interactions between students in ~half the weeks in consistent groups to help students build and maintain social connections.

Transparency and Metacognitive Explanations

For more information: *Supporting Student Learning*.

Students have successful, meaningful experiences when they understand how the components of a course connect together, when they have guidance on how to study, and when they are encouraged to take ownership of their learning. Possible approaches:

- [x] Instructor explanations about the learning goals and overall design or organization of the course.
- [x] Context or rationale to explain the purpose and relevance of major tasks and assignments.

- [x] Guidance or resources for ancillary skills necessary to complete assignments, such as conducting library research or using technology tools.
- [x] Opportunities for students to take ownership or leadership in their learning, such as by choosing topics of interest for an assignment or leading a group discussion or meeting.
- [ ] Opportunities for students to reflect on their learning process, including their goals, study strategies, and progress.
- [x] Opportunities for students to provide feedback on the course.

Please comment on this dimension of the proposed course (or select methods above):

- The Module Overview provides context for each modules, and discusses instructional design and intention for the week. This is supported by the synchronous lecture. Our Module structure provides guidance and both required and optional resources to help support student learning.
- About half of our major module assignments allow students to take ownership of their topic areas within the contraints of the assignment requirements.
- In the Module 13 assignment, we ask for brief feedback on the student's most and least favorite units, and a brief explanation. We can use this information to guide future module selection.
- While we do not have assignments that directly require students to reflect on their learning for a grade, we do our best to scaffold student thinking in these areas. Wasn't sure if that's a check or not!

Additional Considerations

Comment on any other aspects of the online delivery not addressed above (optional):

Syllabus and cover sheet reviewed by Jeremie Smith on 9/25/2023

Reviewer Comments:

Additional resources and examples can be found on ASC's Office of Distance Education website.

GE Foundation Courses

Overview

Courses that are accepted into the General Education (GE) Foundations provide introductory or foundational coverage of the subject of that category. Additionally, each course must meet a set of Expected Learning Outcomes (ELO). Courses may be accepted into more than one Foundation, but ELOs for each Foundation must be met. It may be helpful to consult your Director of Undergraduate Studies or appropriate support staff person as you develop and submit your course.

This form contains sections outlining the ELOs of each Foundation category. You can navigate between them using the Bookmarks function in Acrobat. Please enter text in the boxes to describe how your class meets the ELOs of the Foundation(s) to which it applies. Because this document will be used in the course review and approval process, you should use language that is clear and concise and that colleagues outside of your discipline will be able to follow. Please be as specific as possible, listing concrete activities, specific theories, names of scholars, titles of textbooks etc. Your answers will be evaluated in conjunction with the syllabus submitted for the course.

Accessibility

If you have a disability and have trouble accessing this document or need to receive the document in another format, please reach out to Meg Daly at daly.66@osu.edu or call 614-247-8412.

GE Rationale: Foundations: Race, Ethnicity, and Gender Diversity (3 credits)

Requesting a GE category for a course implies that the course fulfills **all** the expected learning outcomes (ELOs) of that GE category. To help the reviewing panel evaluate the appropriateness of your course for the Foundations: Race, Ethnicity, and Gender Diversity, please answer the following questions for each ELO.

A. Foundations

Please explain in 50-500 words why or how this course is introductory or foundational for the study of Race, Ethnicity and Gender Diversity.

Course Subject & Number: _____

Expected Learning Outcome 2.2: Successful students are able to critically reflect on and share their own experience of observing or engaging in the visual, spatial, literary, or performing arts and design.
Please link this ELO to the course goals and topics and indicate *specific* activities/assignments through which it will be met. *(50-700 words)*

GE Rationale: Foundations: Natural Science (4 credits)

Requesting a GE category for a course implies that the course fulfills **all** expected learning outcomes (ELOs) of that GE category. To help the reviewing panel evaluate the appropriateness of your course for the Foundations: Natural Sciences, please answer the following questions for each ELO.

A. Foundations

Please explain in 50-500 words why or how this course is introductory or foundational in the study of Natural Science.

This course is both introductory and foundational in the study of natural science. Each module is designed to directly connect a phenomenon in our daily lives or larger society with a foundational concept in the field of chemistry. The textbook was selected to present these concepts at an introductory undergraduate level, and the appropriate sections are paired with faculty lectures that reinforce these concepts and then extend them to their implications for the natural world. Students will be assessed both on their understanding of the chemical concepts, and their ability to apply these concepts to the natural world.

Reading quizzes use the Mastering/MyLab bank of online questions in chemistry, aligned to different learning outcomes, and directly assessing mastery of foundational chemical concepts. Our homework assignments and exams will likewise be directly probing understanding of these concepts.

Course Subject & Number: _____

B. Specific Goals for Natural Sciences

GOAL 1: Successful students will engage in theoretical and empirical study within the natural sciences, gaining an appreciation of the modern principles, theories, methods, and modes of inquiry used generally across the natural sciences.

Expected Learning Outcome 1.1: Successful students are able to explain basic facts, principles, theories and methods of modern natural sciences; describe and analyze the process of scientific inquiry. Please link this ELO to the course goals and topics and indicate *specific* activities/assignments through which it will be met. *(50-700 words)*

The course is designed around introducing basic facts, principles, theories, and methods of science.

An appropriate textbook was selected to present chemical concepts at an introductory undergraduate level, and the appropriate sections are paired with faculty lectures that reinforce these concepts and then extend them to their implications for the natural world. Reading quizzes use the Mastering/MyLab bank of online questions in chemistry, aligned to different learning outcomes, and directly assessing mastery of foundational chemical concepts.

Every assignment and exam will have questions about scientific facts, principles, theories, or methods.

Expected Learning Outcome 1.2: Successful students are able to identify how key events in the development of science contribute to the ongoing and changing nature of scientific knowledge and methods. Please link this ELO to the course goals and topics and indicate specific activities/assignments through which it will be met. *(50-700 words)*

We emphasize this theme throughout the course. Changes in the knowledge and methods of science are directly linked to how we have understood the ramifications of our own activities in our world and our environment. This is especially true for chemistry, where so many discoveries have incredible benefits paired with risks that are often misunderstood when new advancements are first applied.

When we discuss radon and radium, we underline our changing understanding of its risks and benefits changed how we approach radiation safety. When we discuss lead in the environment, we discuss our changed understanding of its chemical properties and biological impacts. When we discuss soaps and detergents, sugar, even acids and bases, we talk about the chemical discoveries that enable technological advancements - and the cascading impacts for further discoveries.

Course Subject & Number: _____

Expected Learning Outcome 1.3: Successful students are able to employ the processes of science through exploration, discovery, and collaboration to interact directly with the natural world when feasible, using appropriate tools, models, and analysis of data. Please explain the 1-credit hour equivalent experiential component included in the course: e.g., traditional lab, course-based research experiences, directed observations, or simulations. Please note that students are expected to analyze data and report on outcomes as part of this experiential component. *(50-1000 words)*

We use a combination of approaches to bring exploration of the natural world into this asynchronous course. We split modules between "traditional" lab experiments, directed observation, and simulation. In developing these experiments, we consulted the OSU Residential Handbook to assess resources and restrictions for the typical student, while always keeping in mind that not all students will have these resources.

Each week we will require students to document their experimental work and to report their outcomes through their Experiential Report - typically a worksheet with sections for students to insert photos of their experimental setup, and to report on their results or observations, analysis, and conclusions.

The textbook has "Let's Experiment" sections at the end of each chapter. Where possible, we adapted these exercises for our the asynchronous environment. Where they were not, we developed our own labs. While some of the exercises lean in the direction of guided observations, we work to introduce opportunities for authentic experimentation wherever possible (for example, asking students to investigate materials in their own environments in place of or in addition to those provided in the kits). Module 4 is the most "demo-like" of the modules, and even here we will be asking students to carry out a final set of measurements comparing the readings of their constructed device with the kit-provided thermometer. This can be contrasted with weeks like Module 13 that are more of a traditional laboratory experience carried out at home, with a clear path for observations, analysis, and conclusions.

We include simulations where experiments are not feasible for asynchronous work, such as module 6 (solubility, electrolytes, sugar/salt solutions). The PhET simulations illustrate some important concepts in molecular interactions in solubility, and allow the simulated use of equipment that is not cost-efficient on a per-student basis. However, we will pair it with a hands-on experiment (influence of temperature on solubility) to maintain connection with the real-world experience.

In Module 3 (and to some extent module 10), we also bring a larger data set to support data analysis. In lecture, we will talk about at-home radon test kits and radon mitigation. It is not feasible for students to run their own radon tests, but we can access the online State of Ohio zipcode and county-level data sets for the results of radon tests, and use it to teach simple data analysis approaches using Microsoft Excel that we can then use in later modules (such as 9 and 13). This also serves the larger goals of the course in modeling the use of accessible public data to understand chemical or environmental issues facing their communities.

Course Subject & Number: _____

GOAL 2: Successful students will discern the relationship between the theoretical and applied sciences, while appreciating the implications of scientific discoveries and the potential impacts of science and technology.

Expected Learning Outcome 2.1: Successful students are able to analyze the inter-dependence and potential impacts of scientific and technological developments. Please link this ELO to the course goals and topics and indicate *specific* activities/assignments through which it will be met. *(50-700 words)*

We do this continually throughout the semester.
- In Module 10, we walk students through the changes in chemical processes in soap production, from ~4000 BC, through household soap production in colonial America, through the LeBlanc Process, through the Solvay Process, to Proctor & Gamble Ivory soap, to modern detergents. We assess their understanding in homework and quiz questions.
- In Module 11, we ask students to analyze the chemistry of a personal care product that they use in their own life.
- In Module 12, we walk through sucrose production from sugar cane and the Caribean plantations, through chemical advancements that allowed sugar beets to be used as a source of sucrose. Students are asked to research and report on one aspect of sugar production through history.
- In Module 13 we continue with corn sugar, and discuss current efforts to develop methods to turn biomass into biofuels, assessed through quiz questions.

Expected Learning Outcome 2.2: Successful students are able to evaluate social and ethical implications of natural scientific discoveries. Please link this ELO to the course goals and topics and indicate *specific* activities/ assignments through which it will be met. *(50-700 words)*

Every module asks students to wrestle with this in some way. Chapter 1 introduces the idea of risk/benefit analyses of chemical discoveries and technologies; we use these throughout the semester.

- From the discussion of lead in the water supply in Flint Michigan (assignment: research water quality in a selected US city), to the Radium Girls, to the problems of ocean acidification through industrial emissions, we point out the ways that scientific discovery can cause harm.
-In Module 9 we introduce students directly to the environmental and industrial impacts of road deicers; environmental and infrastructure impacts combined with the chemical benefit of deicers are a required part of their final deicing plan.

In Module 13 we ask students directly to wrestle with the choices made in land use for sugar cane or corn growth for human consumption, animal consumption, and for biofuel generation, at the same time that we talk about scientific efforts develop alternatives to fossil fuels.

Nearly every lecture video addresses one of these concepts.

Course Subject & Number: _____

Expected Learning Outcome 2.3: Successful students are able to critically evaluate and responsibly use information from the natural sciences. Please link this ELO to the course goals and topics and indicate *specific* activities/ assignments through which it will be met. *(50-700 words)*

One reason our textbook was selected was the emphasis on critical thinking.

Chapter 1 introduces risk/benefit analyses for technological advancements. It also introduces the FLaReS approach (falsifiability, logic, replicability, sufficiency) to assess scientific claims.

Every chapter has a set of questions that asks students to evaluate claims related to the topic of that chapter using the FLaReS approach, and/or to evaluate potential interventions or advancements using the risk/benefit approach.

These questions are included in the Mastering/MyLab question bank. For each chapter where the questions are appropriate given the direction of our lecture, we require students to complete the guided FLaReS analysis in the online Reading Quiz (around 50% of weeks).

We ask the students to use this approach in each case where they choose sources to support an argument. For example, in Module 11, we ask students to research a personal care product that they use and develop a presentation to teach others about the chemistry behind their product. ELO 2.3 is assessed directly in two sections of the rubric.

For chemistry particularly, the tension between “natural”, “organic”, and “chemical” has been ongoing for centuries in product and advertisement wars. We directly address this in the module 2 lab, and reinforce the concept through either lecture components or questions in assignments and discussions for modules 9-13.