



COURSE OUTLINE

1. **Course:** CHEM 373, Physical Chemistry: Quantum Chemistry - Fall 2020

Lecture 01: TR 11:00 - 12:15 - Online

Instructor	Email	Phone	Office	Hours
Dr Belinda Heyne	bjmheyne@ucalgary.ca	403 220-3887	SB 419	TBA

In Chem 373, there will be **three (3) different form of assessments** related to the lectures/tutorials and the laboratories.

Quizzes

For the material covered in lectures/tutorials, there will be 5 quizzes during scheduled lectures that will be timed and synchronous. Info on specific dates are found in the grading section of the outline (section 3). Students will have access to the quizzes at the beginning of the scheduled lecture. The quizzes are designed to be completed in 30 minutes but student will be provided with 45 minutes in order to account for any technical issues. The best 4 out of 5 quizzes will be considered for the final grade. Should a student miss a quiz, that will be the one automatically dropped as being the lowest. Time will be adjusted for SAS students if needed and accommodations for students will be done on a case-by-case basis. Students who need accommodation for quizzes must contact Dr. Heyne one week before the first quiz.

Final Examination

In addition to the quizzes, there will be a final examination that will be scheduled by the registrar. This final examination is designed to be completed in 90 minutes. Student will be given 135 minutes to complete it in order to account for any technical issues. Students will have the option to start their exam at a time that best suits their situation within a 24-hour time period.

Laboratories

For the laboratories, there will be 6 different asynchronous activities. Students will be asked to watch videos, perform Microsoft Excel simulations and/or calculations. Each activities will be assessed by either a quiz and/or an assignment. Each laboratory assessment must be completed by the due dates provided in section 3 (grading) in order to be considered for the final grade. Submissions will not be accepted after 11:59 PM on the due date. **Should a student miss a deadline due to exceptional circumstances (e.g. disease, etc.), the student should contact Dr. Heyne within 24-hour and accommodations for students will be granted on a case-by-case basis.** However, if a student fails to contact Dr. Heyne within 48-hour, accommodations will be automatically denied. Should a student miss one of the due date, they will earn a grade of zero for this particular laboratory assessment. Student must submit no less than 4 out of 6 laboratory quizzes and/or assignments for the prerequisite pass (see section 3).

Online Delivery Details:

This course is being offered online in real-time via scheduled meeting times, you are required to be online at the same time.

In Chem 373, **all lectures will be synchronous**. Students are expected to be present for all lectures via Zoom during the scheduled time. However, lectures will be recorded and posted on D2L in case students are unable to attend some lectures. **Lectures will start on September 8, 2020.**

In Chem 373, **all laboratories will be asynchronous**. Students will be asked to watch videos and perform simulations using Microsoft Excel available through the University of Calgary. An evaluation in the form of a quiz and/or an assignment will be due for each laboratory activity. Due dates are provided in section 3 (grading). **Laboratory activities will start on September 8, 2020.**

In Chem 373, **all tutorials will be asynchronous**. Each week, students will be asked to watch videos and review assigned reading. The material covered in tutorials corresponds to practice problems related to the content seen in lectures. **Tutorials will start on the week of September 14, 2020.**

Course Site:

D2L: CHEM 373 L01-(Fall 2020)-Physical Chemistry: Quantum Chemistry

Note: Students must use their U of C account for all course correspondence.

Office hours: TBA. Office hours will be virtual via the Zoom platform and students will have to register to the meeting in order to get access to the link. More information will be provided on the first lecture.

Email Policy: Instructor and TAs will respond to your email inquiries about the course within 36 hours except on weekends and holidays. It is important to note that questions regarding the course and or laboratory material will not be answered individually via email. They will either be answered during office hours, or they will be addressed in lecture for the benefit of everyone. If a question is addressed in lecture, the anonymity of the person asking the question will remain confidential.

2. Requisites:

See section [3.5.C](#) in the Faculty of Science section of the online Calendar.

Prerequisite(s):

Chemistry 201 or 211; and 203 or 213; Physics 223 or 355; Mathematics 267 or 277.

3. Grading:

The University policy on grading and related matters is described in [F.1](#) and [F.2](#) of the online University Calendar.

In determining the overall grade in the course the following weights will be used:

Component(s)	Weighting %	Time
Laboratory	30	-- Various Dates-- See schedule below
In Class Quizzes	40	-- Various Dates --See Schedule below
Final Examination	30	To be scheduled by Registrar

Synchronous In class quizzes schedule

Students who need accommodation for one or all of the quizzes must inform Dr. Heyne no later Tuesday September 15, 2020 at 11:59 pm via email in order to be considered.

Quiz #	Scheduled time
1	Tuesday September 22, 2020 (11 am to 11:45 am)
2	Tuesday October 6, 2020 (11 am to 11:45 am)
3	Tuesday October 20, 2020 (11 am to 11:45 am)
4	Tuesday November 3, 2020 (11 am to 11:45 am)
5	Thursday November 26, 2020 (11 am to 11:45 am)

Laboratory assessment schedule

Title	Due Date
1. Excel Introduction (use formula, create custom functions, make and interpret graphs).	2020-09-18
2. The Uncertainty Principle (Building a Wavepacket - Simulation)	2020-10-02
3. The Absorption of Linear Polyene Dyes (particle in a box)	2020-10-16
4. The Harmonic Oscillator (Simulation)	2020-10-30
5. Molecular Symmetry, Point Groups and Character Tables - Part I	2020-11-13
6. Character Tables and its applications (acetone) - Part II	2020-11-27

Each piece of work (reports, assignments, quizzes, midterm exam(s) or final examination) submitted by the student will be assigned a grade. The student's grade for each component listed above will be combined with the indicated weights to produce an overall percentage for the course, which will be used to determine the course letter grade.

The conversion between a percentage grade and letter grade is as follows.

	A+	A	A-	B+	B	B-	C+	C	C-	D+	D
Minimum % Required	92 %	86 %	82 %	77%	72%	68 %	62 %	58%	55%	52 %	50 %

This course has a registrar scheduled final exam.

Students will be expected to understand at every stage the material covered in all components of

the course. In order to satisfy the prerequisite requirements (i.e., C-) for further Chemistry courses, a student must meet the following requirements: (1) achieve a minimum 50% in the laboratory grading component with submission of no less than 4 out of 6 laboratory quizzes/assignments, AND (2) achieve a minimum 50% on the course theory (the weighted average of the non-laboratory component). This means that if a student submit less than 4 out of 6 laboratory quizzes/assignments or scores below 50% in either the laboratory component or the course theory (weighted average of the non-laboratory component), then the maximum course letter grade they can obtain in CHEM 373 is a D+.

4. Missed Components Of Term Work:

The university has suspended the requirement for students to provide evidence for absences. Please do not attend medical clinics for medical notes or Commissioners for Oaths for statutory declarations.

In the event that a student legitimately fails to submit any online assessment on time (e.g. due to illness etc...), please contact the course coordinator, or the course instructor if this course does not have a coordinator to arrange for a re-adjustment of a submission date. Absences not reported within 48 hours will not be accommodated. If an excused absence is approved, then the percentage weight of the legitimately missed assignment could also be pro-rated among the components of the course.

For the material covered in lectures/tutorials, there will be 5 quizzes during scheduled lectures that will be timed and synchronous. Info on specific dates is provided in section 3 (grading). Students will have access to the quizzes at the beginning of the scheduled lecture. The quizzes are designed to be completed in 30 minutes but student will be provided with 45 minutes in order to account for any technical issues. The best 4 out of 5 quizzes will be considered for the final grade. Should a student miss a quiz, that will be the one automatically dropped as being the lowest. Time will be adjusted for SAS students if needed and accommodations for students will be done on a case-by-case basis. Students who need accommodation for quizzes must contact Dr. Heyne at least one week before the first quiz, so that Dr. Heyne has time to plan.

For the laboratories, there will be 6 different asynchronous activities. Students will be asked to watch videos, perform Microsoft Excel simulations and/or calculations. Each activities will be assessed by either a quiz and/or an assignment. Each laboratory assessment must be completed by the due dates provided in section 3 (grading) in order to be considered for the final grade. Submissions will not be accepted after 11:59 PM on the due date. **Should a student miss a deadline due to exceptional circumstances (e.g. disease, etc.) the student should contact Dr. Heyne within 24-hour and accommodations for students will be granted on a case-by-case basis.** Student should refer to section M1 of the calendar regarding supporting information. **However if a student fails to contact Dr. Heyne within 48-hour, accommodations will be automatically denied .** Should a student miss one of the due date, they will earn a grade of zero for this particular laboratory assessment. Student must submit no less than 4 out of 6 laboratory quizzes and/or assignments for the prerequisite pass (see section 3).

5. Scheduled Out-of-Class Activities:

There are no scheduled out of class activities for this course.

6. Course Materials:

Recommended Textbook(s):

Thomas Engel and Philip Reid, *Physical Chemistry*: Pearson.

In order to successfully engage in their learning experiences at the University of Calgary, students taking online, remote and blended courses are required to have reliable access to the following technology:

- A computer with a supported operating system, as well as the latest security, and malware updates;
- A current and updated web browser;
- Webcam/Camera (built-in or external);
- Microphone and speaker (built-in or external), or headset with microphone;
- Current antivirus and/or firewall software enabled;
- Stable internet connection.

For more information please refer to the UofC [ELearning](#) online website.

7. Examination Policy:

Students who require accommodation must be registered with Student Accessibility Services (SAS) (see section 12 (f.) below), and must identify themselves to their instructor as soon as possible.

Time will be adjusted for SAS students if needed and accommodations for students will be done on a case-by-case basis. Students who need accommodation for on or all the quizzes must contact Dr. Heyne one week before the first quiz (before September 15, 2020 at 11:59 pm).

In Chem 373, there will be a final examination that will be scheduled by the registrar. This final examination is designed to be completed in 90 minutes. Student will be given 135 minutes to complete it in order to account for any technical issues. Students will have the option to start their exam at a time that best suits their situation within a 24-hour time period, ending at the end of the registrar-scheduled exam time slot.

In Chem 373, all the quizzes and the final examination are "open-notes". Reference to your course notes, your own formula sheet, or your own textbook (electronic or paper edition) are allowed. As in previous years, it is suggested that you create your own formula sheet that includes important formula and constant values. No other aids are allowed on quizzes and/or the final examination, including accessing internet resources such as search engines (Google, etc.), other websites, shared documents (Google docs etc.) or chat servers (Discord, WhatsApp, etc.), etc., and you are specifically prohibited from working with or contacting any other individuals while you complete the quizzes and/or the final examination. **It is important to note that the time required for browsing your own course notes or textbook is not taken into consideration when evaluating the time it requires to complete the quizzes and/or final examination.** This is why it is strongly advised for you to create your own formula sheet for an easy access to formula and constant values.

Students should also read the Calendar, [Section G](#), on Examinations.

8. Approved Mandatory And Optional Course Supplemental Fees:

Not applicable

9. Writing Across The Curriculum Statement:

For all components of the course, in any written work, the quality of the student's writing (language, spelling, grammar, presentation etc.) can be a factor in the evaluation of the work. See also Section [E.2](#) of the University Calendar.

10. Human Studies Statement:

If you agree, your course work may be used for research purposes. Your responses will remain anonymous and confidential. Grouped data (no individual responses) may be used in academic presentations and publications. Participation in such research is voluntary and will not influence grades in this course. Students' signed consent forms will be withheld from instructors until after final grades are submitted. More information will be provided at the time student participation is requested.

See also [Section E.5](#) of the University Calendar.

11. Reappraisal Of Grades:

A student wishing a reappraisal, should first attempt to review the graded work with the Course coordinator/instructor or department offering the course. Students with sufficient academic grounds may request a reappraisal. Non-academic grounds are not relevant for grade reappraisals. Students should be aware that the grade being reappraised may be raised, lowered or remain the same. See [Section I.3](#) of the University Calendar.

- a. **Term Work:** The student should present their rationale as effectively and as fully as possible to the Course coordinator/instructor within **ten business days** of either being notified about the mark, or of the item's return to the class. If the student is not satisfied with the outcome, the student shall submit the Reappraisal of Graded Term work form to the department in which the course is offered within 2 business days of receiving the decision from the instructor. The Department will arrange for a reappraisal of the work within the next ten business days. The reappraisal will only be considered if the student provides a detailed rationale that outlines where and for what reason an error is suspected. See sections [I.1](#) and [I.2](#) of the University Calendar
- b. **Final Exam:** The student shall submit the request to Enrolment Services. See [Section I.3](#) of the University Calendar.

12. Other Important Information For Students:

- a. **Mental Health** The University of Calgary recognizes the pivotal role that student mental health plays in physical health, social connectedness and academic success, and aspires to create a caring and supportive

campus community where individuals can freely talk about mental health and receive supports when needed. We encourage you to explore the mental health resources available throughout the university community, such as counselling, self-help resources, peer support or skills-building available through the SU Wellness Centre (Room 370, MacEwan Student Centre, [Mental Health Services Website](#)) and the Campus Mental Health Strategy website ([Mental Health](#)).

- b. **SU Wellness Center:** For more information, see www.ucalgary.ca/wellnesscentre or call [403-210-9355](tel:403-210-9355).
- c. **Sexual Violence:** The Sexual Violence Support Advocate, Carla Bertsch, can provide confidential support and information regarding sexual violence to all members of the university community. Carla can be reached by email ([svsa@ucalgary.ca](mailto:svs@ucalgary.ca)) or phone at [403-220-2208](tel:403-220-2208). The complete University of Calgary policy on sexual violence can be viewed at (<https://www.ucalgary.ca/policies/files/policies/sexual-violence-policy.pdf>)
- d. **Misconduct:** Academic misconduct (cheating, plagiarism, or any other form) is a very serious offence that will be dealt with rigorously in all cases. A single offence may lead to disciplinary probation or suspension or expulsion. The Faculty of Science follows a zero tolerance policy regarding dishonesty. Please read the sections of the University Calendar under [Section K](#). Student Misconduct to inform yourself of definitions, processes and penalties. Examples of academic misconduct may include: submitting or presenting work as if it were the student's own work when it is not; submitting or presenting work in one course which has also been submitted in another course without the instructor's permission; collaborating in whole or in part without prior agreement of the instructor; borrowing experimental values from others without the instructor's approval; falsification/ fabrication of experimental values in a report. **These are only examples.**
- e. **Academic Accommodation Policy:** Students needing an accommodation because of a disability or medical condition should contact Student Accessibility Services in accordance with the procedure for accommodations for students with disabilities available at [procedure-for-accommodations-for-students-with-disabilities.pdf](#).

Students needing an accommodation in relation to their coursework or to fulfill requirements for a graduate degree, based on a protected ground other than disability, should communicate this need, preferably in writing, to the Associate Head of the Department of Chemistry, Dr. Yuen-Ying Carpenter by email ahugchem@ucalgary.ca or phone [403-220-6908](tel:403-220-6908). Religious accommodation requests relating to class, test or exam scheduling or absences must be submitted no later than **14 days** prior to the date in question. See [Section E.4](#) of the University Calendar.
- f. **Freedom of Information and Privacy:** This course is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIP). Students should identify themselves on all written work by placing their name on the front page and their ID number on each subsequent page. For more information, see [Legal Services](#) website.
- g. **Student Union Information:** [VP Academic](#), Phone: [403-220-3911](tel:403-220-3911) Email: suvpaca@ucalgary.ca. SU Faculty Rep., Phone: [403-220-3913](tel:403-220-3913) Email: sciencerep@su.ucalgary.ca. [Student Ombudsman](#), Email: ombuds@ucalgary.ca.
- h. **Surveys:** At the University of Calgary, feedback through the Universal Student Ratings of Instruction ([USRI](#)) survey and the Faculty of Science Teaching Feedback form provides valuable information to help with evaluating instruction, enhancing learning and teaching, and selecting courses. Your responses make a difference - please participate in these surveys.
- i. **Copyright of Course Materials:** All course materials (including those posted on the course D2L site, a course website, or used in any teaching activity such as (but not limited to) examinations, quizzes, assignments, laboratory manuals, lecture slides or lecture materials and other course notes) are protected by law. These materials are for the sole use of students registered in this course and must not be redistributed. Sharing these materials with anyone else would be a breach of the terms and conditions governing student access to D2L, as well as a violation of the copyright in these materials, and may be pursued as a case of student academic or [non-academic misconduct](#), in addition to any other remedies available at law.

Laboratory Information

Laboratory activities will begin the week of September 8, 2020. All laboratory activities will be asynchronous. The activities will be posted online on the course D2L site.

Students repeating the course within the last two years can be exempted from the Laboratory Component of the course if a grade of 75% or higher was obtained on the lab portion. Students choosing to exempt from the lab should be aware that,

- the new online labs in Fall 2020 may be significantly different from prior labs in this course;
- the material covered in these online labs will be integrated into other course assessments; and,
- the lab grade achieved on the previous attempt will be carried forward.

Prior to applying for an exemption, students are encouraged to connect with their course instructor or coordinator to better understand the risks and benefits in their specific online course, as well as what access they will (or will not) have to lab materials or feedback as an exempt student.

Students applying for a lab exemption should contact the Undergraduate Science Center (science.advising@ucalgary.ca) **no later than Monday September 14th, 2020** to apply. Students registering in the course after this date should contact the USC as soon as possible if they wish to apply for an exemption.

Course Outcomes:

- recognize the limitations of classical mechanics at molecular length scales
- identify the differences between classical and quantum mechanics
- illustrate the connection of quantum mechanical operators to observables
- evaluate probabilities, amplitudes, averages, expectation values, and observables
- explain the quantum mechanical nature of the chemical bond.
- practice how molecular phenomena can be related to model problems
- predict structure, bonding of molecules with the help of qualitative molecular orbital and valence bond theory

Electronically Approved - Sep 02 2020 10:46

Department Approval