

## Introduction to Colloid and Surface Chemistry

Chemistry 347

Winter Term, 2022

Asynchronous Remote

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### Course Description

Colloid and Surface Chemistry provides students with an introduction to the captivating world of small dimensions and large surfaces. The colloidal state is defined by systems that contain dimensions in the nanometer to micrometer size domain. Hence, the colloidal state of particulate matter is intricately linked to the thermodynamic and topological properties of surfaces. The course will touch on terminology used and emphasize the importance of particle size, topological feature size, and polydispersity. Among the topics treated are the formation and stability of colloidal systems, colligative properties, optical properties of colloids and surfaces, charged surfaces, wetting, detergency, micelle formation, emulsions, liposomes, rheology of colloids, foam stability, ore flotation, and adsorption at the gas-liquid and solid-gas interface. The course introduces basic physical chemistry theories that are richly annotated with fascinating examples from both the natural world and recent developments in chemical and materials sciences.

### Intended Student Learning Outcomes and Methods of Assessment

Upon successful completion of this course students will be able to:

1. Converse fluently in the language of colloid and surface science;
2. Appreciate the importance of polydispersity in colloidal systems;
3. Understand strengths and weaknesses for a range of methods to determine particle size and weight;
4. Understand various ways of measuring surface and interfacial tension;
5. Value the importance of interfacial free energy in colloid and surface chemistry;
6. Design methods to produce stable colloidal systems (emulsions, sols, gels, dispersions, foams, etc.);
7. Appreciate the importance of surface charge in colloidal systems;
8. Understand adsorption at the gas-liquid and solid-gas interface;
9. Know about wetting and liquid repellancy on surfaces;
10. Assess the rheological (flow) properties in colloidal systems.

The above learning outcomes will be evaluated through a series of 10 weekly, time-limited quizzes, to be given through onQ in a multiple choice format. Quizzes are to be done individually. Students are expected to post a 10 minute PowerPoint presentation in a dedicated onQ forum on a product or process related to the course. The topic needs to be approved by the instructor and should have some academic papers for background. Students are to ask and answer questions from their peers in the forum. A final exam will be given at the end of term (location and mode TBA).

Knowledge and critical thinking skills developed throughout the course are directly transferrable to future independent research and decision making in graduate school, the chemical industry or government employment, as colloid and surface chemistry plays a pervasive and important role in our daily lives.

#### Course Materials/Readings and Timeline

Introduction to Colloid and Surface Chemistry by D.J. Shaw (Fourth Edition). A PDF copy is available through the Queen's Library portal.

Additional material will be presented through narrated PowerPoint files that are posted under the timeline section in the onQ course site and as relevant YouTube videos from the internet.

Narrated PowerPoint tutorials with guidance on how to approach the problems at the end of the textbook are also provided under the timeline section in the onQ course site.

Students are expected to select a topic for their 10 minute PowerPoint presentation. Your topic needs to be approved by the instructor. Academic papers related to the presentation should be accessed through the Queen's Library website.

#### Grading Scheme

Weekly Quizzes	40% (8 x 5% out of 10)
PowerPoint Presentation and Participation in Q&A	20%
Final Exam	40%

The instructor reserves the right to reweigh the above in the students' favour.

Regardless of how and where you retrieve information, the principles of academic integrity apply. Please visit these helpful websites to help you make sure that you are able to present things in your own words for the PowerPoint presentation and to provide appropriate attribution to sources used:

- <https://www.queensu.ca/academicintegrity/students/avoiding-plagiarismcheating>
- <https://integrity.mit.edu/handbook/academic-writing/avoiding-plagiarism-paraphrasing>
- [http://writing.wisc.edu/Handbook/QPA\\_paraphrase.html](http://writing.wisc.edu/Handbook/QPA_paraphrase.html)

#### Working in Groups

You are permitted to work with a partner or in groups of 3 to encourage collaboration, cooperation, and collective learning on end of chapter problems and problems provided through the tutorial PowerPoint presentations. You are not permitted to share complete answers in onQ, or through any other means. You must work independently on the quizzes and PowerPoint presentation and Q&A. Your independent work on these, and your collaborative work on the practice questions from the textbook and tutorials, will help you to prepare for the proctored final exam.

#### Grading Method

In this course, quizzes and the final exam will be graded using numerical percentage marks. The PowerPoint presentation component will receive letter grades, which for purposes of calculating your course average will be translated into numerical equivalents using the Faculty of Arts and Science approved scale (see below). Your course average will then be converted to a final letter grade according to Queen's Official Grade Conversion Scale (see below). Grades will be accessible through the Grade Book feature in onQ.

#### **Arts & Science Letter Grade Input Scheme**

Assignment mark	Numerical value for calculation of final mark
A+	93
A	87
A-	82
B+	78
B	75
B-	72
C+	68
C	65
C-	62
D+	58
D	55
D-	52
F48 (F+)	48
F24 (F)	24
F0 (O)	0

#### **Queen's Official Grade Conversion Scale**

Grade	Numerical Course Average (Range)
A+	90-100
A	85-89
A-	80-84
B+	77-79
B	73-76
B-	70-72
C+	67-69
C	63-66
C-	60-62
D+	57-59
D	53-56
D-	50-52
F	49 and below

#### Late Policy

There may be a time when you are unable to study for or complete a quiz for personal reasons. To build in some flexibility for all students, only your 8 best quizzes (of 10) will count towards your course grade.

The PowerPoint presentation assignment can be posted anytime during weeks 1-10 of the term. This assignment has been designed with flexibility for academic consideration for all students in mind. No "Requests for Academic Consideration" (submitted through the Faculty of Arts and Science portal without documentation) pertaining to this assignment will be approved, except in very exceptional circumstances on a case-by-case basis. Please note that you will receive a letter grade for this component of the course, based on the quality of your presentation and how you answer and ask questions from your peers in the forum. Hence, it is wise to post your file **early** in the term so that it can attract the maximum amount of discussion.

#### Location and Timing of Final Examinations

A final exam will be given during the week following the end of term. The exact time and date as well as the mode of delivery will be announced at a later date. **Students should delay finalizing any travel plans until after the examination schedule has been posted. Exams will not be moved or deferred to accommodate employment, travel/holiday plans or flight reservations.**

#### Academic Integrity

Queen's students, faculty, administrators and staff all have responsibilities for upholding the fundamental values of academic integrity; honesty, trust, fairness, respect, responsibility and courage (see [www.academicintegrity.org](http://www.academicintegrity.org)). These values are central to the building, nurturing and sustaining of an academic community in which all members of the community will thrive. Adherence to the values expressed through academic integrity forms a foundation for the "freedom of inquiry and exchange of ideas" essential to the intellectual life of the University (see the Senate Report on Principles and Priorities here: <http://www.queensu.ca/secretariat/policies/senate/report-principles-and-priorities>).

Students are responsible for familiarizing themselves with the regulations concerning academic integrity and for ensuring that their assignments and their behaviour conform to the principles of academic integrity. Information on academic integrity is available in the Arts and Science Calendar (see Academic Regulation 1 here: <http://www.queensu.ca/artsci/academic-calendars/regulations/academic-regulations/regulation-1>), on the Arts and Science website (see here: <https://www.queensu.ca/artsci/students-at-queens/academic-integrity>), and from the instructor of this course. Departures from academic integrity include plagiarism, use of unauthorized materials, facilitation, forgery and falsification, and are antithetical to the development of an academic community at Queen's. Given the seriousness of these matters, actions which contravene the regulation on academic integrity carry sanctions that can range from a warning, the loss of grades, to the failure of a course to a requirement to withdraw from the university.

#### Calculator Policy

As noted in Academic Regulation 9.2, "Calculators acceptable for use during quizzes, tests and examinations are intended to support the basic calculating functions required by most Arts and Science courses. For this purpose, the use of the **Casio 991 series calculator** is permitted and is the only approved calculator for Arts and Science students."

#### Web Browsers

onQ performs best when using the most recent version of the web browsers, Chrome or Firefox. Safari and Edge are strongly discouraged as these web browsers are known to cause issues with onQ.

#### Internet Speed

While wired internet connection is encouraged, we recognize that students may be relying on a wireless connection. A minimum download speed of 10 Mbps and up to 20 Mbps for multimedia is recommended. To test your internet speed go to <https://www.speedtest.net/>

For technology support ranging from setting up your device, issues with onQ to installing software, contact ITS Support Centre <https://www.queensu.ca/its/itsc>

#### Accommodations for Disabilities

Queen's University is committed to achieving full accessibility for people with disabilities. Part of this commitment includes arranging academic accommodations for students with disabilities to ensure they have an equitable opportunity to participate in all of their academic activities. The Senate Policy for Accommodations for Students with Disabilities was approved at Senate in November 2016 (see here: <https://www.queensu.ca/secretariat/sites/webpublish.queensu.ca.uslcwww/files/files/policies/senate-andtrustees/ACADACCOMMPOLICY2016.pdf>). If you are a student with a disability and think you may need academic accommodations, you are strongly encouraged to contact the Queen's Student Accessibility Services (QSAS) and register as early as possible. For more information, including important deadlines, please visit the QSAS website at: <http://www.queensu.ca/studentwellness/accessibility-services/>

#### Academic Considerations for Students in Extenuating Circumstances

Queen's University is committed to providing academic consideration to students experiencing extenuating circumstances that are beyond their control and are interfering with their ability to complete academic requirements related to a course for a short period of time. The Senate Policy on Academic Consideration

for Students in Extenuating Circumstances is available here: <http://www.queensu.ca/secretariat/sites/webpublish.queensu.ca.uslcwww/files/files/policies/senateandtrustees/Academic%20Considerations%20for%20Extenuating%20Circumstances%20Policy%20Final.pdf>

Each Faculty has developed a protocol to provide a consistent and equitable approach in dealing with requests for academic consideration for students facing extenuating circumstances. Arts and Science undergraduate students can find the Faculty of Arts and Science protocol and the portal where a request can be submitted at: <http://www.queensu.ca/artsci/accommodations>. Students in other Faculties and Schools who are enrolled in this course should refer to the protocol for their home Faculty.

If you need to request academic consideration for this course, you will be required to provide the name and email address of the instructor/coordinator. Please use the following:

Instructor/Coordinator Name: Professor Simon A.M. Hesp  
Instructor/Coordinator email address: [Simon.Hesp@chem.queensu.ca](mailto:Simon.Hesp@chem.queensu.ca)

#### Discussion Guidelines

University is a place to share, question and challenge ideas. Each student brings a different lived experience from which to draw upon. To help one another learn the most we can from this experience please consider the following guidelines:

1. Make a personal commitment to learn about, understand, and support your peers.
2. Assume the best of others and expect the best of them.
3. Acknowledge the impact of oppression on the lives of other people and make sure your writing is respectful and inclusive.
4. Recognize and value the experiences, abilities, and knowledge each person brings.
5. Pay close attention to what your peers write before you respond. Think through and re-read your writings before you post or send them to others.
6. It's ok to disagree with ideas, but do not make personal attacks.
7. Be open to being challenged or confronted on your ideas and to challenging others with the intent of facilitating growth. Do not demean or embarrass others.
8. Encourage others to develop and share their ideas.