



COURSE CHEM 221

MATERIALS, SOLUTIONS AND INTERFACES

GENERAL INFORMATION

Course instructor	Dr. Jean-Michel Nunzi CHE 310, Chernoff Hall Phone: 36749 E-mail: nunzjm@queensu.ca
Lab coordinator	Kristen Harrington CHE 124, Chernoff Hall Phone: 36000, ext. 74665 E-mail: kvh4@queensu.ca
Web site	Access CHEM 221 OnQ space at: https://onq.queensu.ca/ active enrolment required.
Lectures	[REDACTED] Schedule: [REDACTED]
Office hours	[REDACTED] by virtual appointment only
Required textbook	Lectures: P. Atkins, J. de Paula, <i>Physical Chemistry</i> , 12 th , 11 th , 10 th or 9 th Edition, Oxford University Press Tutorials: P. Atkins, C. A. Trapp, M. P. Cady, C. Giunta, <i>Student Solutions Manual for Physical Chemistry</i> Laboratory: Laboratory Manual
Recommended software	MS Excel
Laboratory	[REDACTED]
Tutorials Monday	[REDACTED] During tutorials, textbook problems will be solved step-by-step.
Marking	Laboratory reports: 25% Quiz (2 × 10%) during class: 1 st Quiz [REDACTED] Midterm examination: 25% - 2h after mid-term Final examination: 30% - 3h exam end of term Total 100% A common equation sheet will append each quiz as well as the midterm and final examinations. You may use this equation sheet during the quizzes and the examinations.

	Students must pass BOTH the lecture/tutorial and the laboratory components to pass the course. Students must obtain a weighted average mark of OVER 50% on the written exams to pass the lecture/tutorial component. If a student does not pass the lecture/tutorial and the lab components of the course, they will fail the entire course.
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COURSE OUTLINE

- 1. Overview of first law of thermodynamics:** Overview of basic concepts learnt in the first-year chemistry course; Thermochemistry; State functions and exact differentials; *Chapter 2 in all editions.* (4 lectures)
- 2. Overview of the second and third laws of thermodynamics:** Direction of spontaneous change; Helmholtz and Gibbs energies; Combining the first and second laws; *Chapter 3 in all editions.* (4 lectures)
- 3. Phase transitions and Simple mixtures:** Phase diagrams; Thermodynamic aspects of phase diagrams; *Chapter 4 in all editions.* (1 lecture) - Thermodynamic description of mixtures; Properties of solutions; Phase diagrams of binary systems; Activities; *Chapter 5 in all editions.* (7 lectures)
- 4. Equilibrium electrochemistry:** Half-reactions and electrodes; Varieties of cells; The cell potential; Standard electrode potentials; Application of standard potentials; *Chapter 6 in all editions.* (3 lectures)
- 5. Solids:** Crystallography; The properties of solids; *Chapter 15 in the 11th, Chapter 18 in the 10th and Chapter 19 in the 9th edition.* (3 lectures)
- 6. Molecular interactions:** Electric properties of molecules; Interactions between molecules; Gases and liquids; *Chapter 14 in the 11th edition, Chapter 16 in the 10th and Chapter 17 in the 9th.* (2 lectures)

Learning Outcomes

1. *Apply the basic laws of thermodynamics, 1st and 2nd principles and state functions in a variety of contexts: Chemical reactions, phase transitions, simple mixtures, and equilibrium electrochemistry.*
2. *List the fundamental properties of solids and molecular interactions, and describe how to measure them and how to relate their properties to their atomic composition, nature and organization.*
3. *Apply the above properties to resolve simple problems which are representative of practical situations faced in a chemistry laboratory: Describe characterization methods for the analysis of the physicochemical relationships between atoms, molecules and their properties.*
4. *Manipulate and interconvert dimensions and units.*

Land Acknowledgement

The territory that Queen's University occupies is included in the Dish with One Spoon Wampum Belt Covenant, an agreement between the Iroquois Confederacy and the Confederacy of the Ojibwe and Allied Nations to peaceably share and care for the resources around the Great Lakes. The Kingston Indigenous community continues to reflect the area's

Anishinaabek and Haudenosaunee roots. There is also a significant Métis community as well as First Peoples from other Nations across Turtle Island present here today.

Equity, Diversity, and Inclusivity Statement

Queen's University recognizes that the values of equity and diversity are vital to and in harmony with its educational mission and standards of excellence. It acknowledges that direct, indirect, and systemic discrimination exists within our institutional structures, policies, and practices and in our community. These take many forms and work to differentially advantage and disadvantage persons across social identities such as race, ethnicity, disability, gender identity, sexual orientation, faith, and socioeconomic status, among other examples. In this class I will work to promote an anti-discriminatory, anti-racist and accountable environment where everyone feels welcome. Every member of this class is asked to show respect for every other member.

Academic Integrity

Queen's University is dedicated to creating a scholarly community free to explore a range of ideas, to build and advance knowledge, and to share the ideas and knowledge that emerge from a range of intellectual pursuits. Queen's students, faculty, administrators and staff therefore all have responsibilities for supporting and upholding the fundamental values of academic integrity. Academic integrity is constituted by the five core fundamental values of honesty, trust, fairness, respect and responsibility and by the quality of courage. These values and qualities 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.

Students are responsible for familiarizing themselves with and adhering to the Senate [regulations](#) concerning academic integrity, along with [Faculty or School](#) specific information. Departures from academic integrity include, but are not limited to, plagiarism, use of unauthorized materials, facilitation, forgery and falsification. Actions which contravene the regulation on academic integrity carry sanctions that can range from a warning, to loss of grades on an assignment, to failure of a course, to requirement to withdraw from the university.

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