



## COURSE CHEM 221

### MATERIALS, SOLUTIONS AND INTERFACES

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#### GENERAL INFORMATION

<b>Course instructor</b>	Dr. Jean-Michel Nunzi CHE 310, Chernoff Hall Phone: 36749 E-mail: <a href="mailto:nunzjm@queensu.ca">nunzjm@queensu.ca</a>	
<b>Lab instructor</b>	Dr. Igor Kozin CHE 124, Chernoff Hall Phone: 36000, ext. 74665 E-mail: <a href="mailto:igor.kozin@chem.queensu.ca">igor.kozin@chem.queensu.ca</a>	
<b>Web site</b>	Access <b>CHEM 221</b> OnQ space at: <a href="https://onq.queensu.ca/">https://onq.queensu.ca/</a> (active enrolment required).	
<b>Lectures</b>	Remote Lectures only Schedule: <b>Mon. 09:30-10:30, synchronous;</b> <b>Wed. 08:30-09:30 and Thursday. 10:30-11:30, asynchronous</b>	
<b>Office hours</b>	<b>Thursday. 10:30-noon</b>	
<b>Required textbook</b>	<b>Lectures:</b> P. Atkins, J. de Paula, <i>Physical Chemistry</i> , 11 <sup>th</sup> , 10 <sup>th</sup> or 9 <sup>th</sup> Edition, W. H. Freeman & Co., New York <b>Tutorials:</b> P. Atkins, C. A. Trapp, M. P. Cady, C. Giunta, <i>Student Solutions Manual for Physical Chemistry</i> , 10 <sup>th</sup> or 9 <sup>th</sup> Edition, W. H. Freeman & Co., New York <b>Laboratory:</b> Laboratory Manual	
<b>Recommended software</b>	MS Excel	
<b>Laboratory Monday 14:30 - 17:30</b>	10-janv	Introductory Lab (REMOTE TEAMS meeting, attendance mandatory)
<b>Laboratory</b>	Labs will be held remotely: <b>Experiment 1:</b> <i>(Vapour-Liquid) Phase Equilibrium (PE)</i> <b>Experiment 2:</b> <i>MB Adsorption (MB)</i> <b>Experiment 3:</b> <i>Electrochemistry of Non-ideal Solutions (NIS)</i> <b>Experiment 4:</b> <i>Cyclic Voltammetry (CV)</i>	

<b>Tutorials</b> <b>Wednesday</b> <b>13:30 - 14:30</b>	During tutorials, some textbook problems will be solved step-by-step.
<b>Marking</b>	<p>           Laboratory reports: <b>25%</b>            Quiz (2 × 10%): <b>20% (Quiz 1 February 07<sup>th</sup>; Quiz 2 March 7<sup>th</sup>)</b>            Midterm examination: <b>25% (take-home exam February 14 to 18)</b>            Final examination: <b>30% (3h exam)</b>            Total <b>100%</b> </p> <p>           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. No other equation sheets are authorized for use during quizzes and 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. Students who do not attend all laboratory sessions may be assigned a grade of incomplete (IN) and be required to attend and pass the missed lab(s) the following year before the IN is cleared from their transcript.         </p>

## 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 11<sup>th</sup>, Chapter 18 in the 10<sup>th</sup> and Chapter 19 in the 9<sup>th</sup> edition.* (3 lectures)

### 6. Molecular interactions

Electric properties of molecules; Interactions between molecules; Gases and liquids; *Chapter 14 in the 11<sup>th</sup> edition, Chapter 16 in the 10<sup>th</sup> and Chapter 17 in the 9<sup>th</sup>.* (2 lectures)

### 7. Molecules in motion (subject will be covered if time allows)

Molecular motion; Molecular motion in liquids; Diffusion; *Chapter 16 in the 11<sup>th</sup>, Chapter 19 in the 10<sup>th</sup> and Chapter 20 in the 9<sup>th</sup> edition.*

## Academic Integrity

Academic integrity is constituted by the five core fundamental values of honesty, trust, fairness, respect and responsibility (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 at: <http://www.queensu.ca/secretariat/policies/senateandtrustees/principlespriorities.html>).

Students are responsible for familiarizing themselves with the regulations concerning academic integrity and for ensuring that their assignments conform to the principles of academic integrity. Information on academic integrity is available in the Arts and Science Calendar (see Academic Regulation 1 at: <http://www.queensu.ca/artsci/academic-calendars/2011-2012-calendar/academic-regulations/regulation-1> on the Arts and Science website (<http://www.queensu.ca/artsci/academics/undergraduate/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 or the loss of grades on an assignment to the failure of a course to a requirement to withdraw from the university.

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