Course Instructor: William Newstead, wn1@queensu.ca, Dupuis Hall 306, Phone 613-533-6000 x 75818
Office Hours: tba

TA Information:

Tutorial Teaching Assistants

The Tutorial TA’s are mainly upper year undergraduate students. They are responsible for leading the Tutorials, administering and marking the two quizzes. The list of TAs will be published on OnQ.

The goal of the course is two-fold:

- To strengthen the student’s understanding of basic chemistry, important for any well-rounded applied science student, and directly applicable in every field of engineering.
- To apply chemical principles to a number of selected material science concepts and basic chemical engineering issues.

Intended Student Learning Outcomes

By the end of this course students should be able to:

- Know and understand basic microscopic models of Matter so they can build up macroscopic models of materials
- use concepts of gas theory to calculate system conditions and measure changes.
- Understand the development of mathematical models of microscopic level properties
- Understand and use Thermodynamics to determine energy changes in isobaric, adiabatic and isothermal system processes, both chemical and physical
- Recognise and describe phase diagrams for single and multi-component (solutions) systems, including distillations, fractional melting and alloys

Lecture Set 1

Thermodynamics

7 lectures

- Isothermal Reversible processes
- Adiabatic reversible processes
• Entropy changes in reactions
• Spontaneous processes
• Gibb’s energy

_Lecture Set 2_

**Kinetics**

6 lectures

Rates of Reaction

• Introduction to reaction rates
• Reaction rates/rate laws
• First order reactions
• Higher order reactions
• Reaction mechanics
• Temperature effects on rates
• Reaction dynamics
• Catalysis

_Lecture Set 3_

**Equilibrium**

4 lectures

Introduction to equilibrium

• Equilibrium review
• Factors affecting equilibrium

Thermodynamics Description of equilibrium

• Gibb’s energy
• How T affects K

_Textbook References: Petrucci chapter 15_

_Lecture Set 4_

**Acids and Bases**
6 lectures

- Acid base equilibrium
- Hydrolysis of salts
- Buffer solutions
- Acid Base reactions

Lecture Set 5
Electrochemistry

6 Lectures

Oxidation Reduction Processes

- Oxidation-reduction reactions
- Balancing Redox reactions
- Galvanic cells
- Applications of galvanic cells
- Corrosion
- Electrolysis
- Commercial electrolysis

Lecture Set 6
States of Matter and Phase Transitions
1 lecture

Topic
- Phase change overview
- Vapour pressure
  - Clausius Clapeyron equation
- Intermolecular forces (van der Waals forces)
  - London forces
  - Dipole-dipole forces
  - Hydrogen bonding
  - Viscosity
  - Surface tension
- Liquid-vapour phase transitions (Boiling/condensing)
  - One-component Phase diagrams

Lecture Set 7
Organic Chemistry
4 lectures

Introduction to organic chemistry

- Nomenclature
  - hydrocarbons
  - cyclic hydrocarbons
  - heteroatom functional groups
- Isometry

Reactions

- Reactions of unsaturated hydrocarbons
- Reaction Mechanisms

Textbooks/Readings
Petrucci Herring Madura Bissonette, General Chemistry Principles and Modern Applications 11e, Pearson Toronto, Canada, 2016

Grading Scheme
- Quizzes (Weeks 4 and 11) 15%
- Mastering Chemistry on-line Work* 5%
- Midterm exam (Week 6) 35%
- Final examination 45%

* Note that the Mastering Chemistry on-line assignments will be due each week. Check the Mastering Site for the due dates. To access the on-line component, you will need an access code. If you were registered in 131 this fall, the same one will work. There are two options to getting an access code:
  1. Bound text book purchased new from the book store: Inside the package for the new text book you will find the printed answer key to all the end of chapter questions in the text. You will also find an access code, included free, that will give you access to the e-book (for on-line reference) and the Mastering site.
  2. Loose-leaf text purchased from the book store. Other items in this package are identical to Package 1.
  3. If you purchase a used book, you will still need to purchase the access key to the Mastering Chemistry Site You can purchase this key on line or at the bookstore. Be careful to work that into your costs. It may be cheaper to go with option 1 or 2.

Grading Method
All components of this course will receive numerical percentage marks. The final grade you receive for the course will be derived by converting your numerical course average to a letter grade according to Queen’s Official Grade Conversion Scale:
### Queen’s Official Grade Conversion Scale

<table>
<thead>
<tr>
<th>Grade</th>
<th>Numerical Course Average (Range)</th>
</tr>
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<tbody>
<tr>
<td>A+</td>
<td>90-100</td>
</tr>
<tr>
<td>A</td>
<td>85-89</td>
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<tr>
<td>A-</td>
<td>80-84</td>
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<tr>
<td>D-</td>
<td>50-52</td>
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<td>F</td>
<td>49 and below</td>
</tr>
</tbody>
</table>

**Evaluation**

**Late Policy**

- Weekly homework assignments that are past due will receive a grade of zero.
- Quizzes are done in tutorial. You are either present or not for those.
- Midterm exams will be announced in class.
- Final Exams are administered by the exams office. Please make sure you have contacted them for any accommodations you may need. Delaying contacting them may result in your not receiving any consideration.

1. **Location and Timing of Final Examinations**

The exam dates for each Term are listed on the Faculty of Arts and Science webpage under “Important Dates.” Student exam schedules for the Fall Term are posted via SOLUS immediately prior to the Thanksgiving holiday; for the Winter Term they are posted on the Friday before Reading Week, and for the Summer Term they are individually noted on the Arts and Science Online syllabi. **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.** Also, as indicated in Academic Regulation 8.3, students must write all final examination in all on-campus courses on the Kingston campus.

2. **Statement on Academic Integrity**

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 (see [http://www.academicintegrity.org](http://www.academicintegrity.org)) 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 regulations concerning academic integrity. General information on academic integrity is available at Academic Integrity @ Queen's University, 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.

3. **Calculator Policy**

Calculators acceptable for use during quizzes, tests and examinations are intended to support the basic calculating functions required by most Queen's University courses. For this purpose, the use of the Casio 991 series calculator is permitted and is the only automatically approved calculator. This inexpensive calculator can be purchased at the Queen's Campus Bookstore, Staples and other popular suppliers of school and office supplies.

CAUTION: Any other calculator may be confiscated by the Proctors in the Midyear or the Final exams room, leaving you with no calculator to use in the exam.

4. **Copyright of Course Materials**

“This material is designed for use as part of APSC132 at Queen's University and is the property of the instructor unless otherwise stated. Third party copyrighted materials (such as book chapters and articles) have either been licensed for use in this course or fall under an exception or limitation in Canadian Copyright law.

Copying this material for distribution (e.g. uploading material to a commercial third-party website) can lead to a violation of Copyright law. Find out more about copyright here: http://library.queensu.ca/copyright.”

5. **Privacy Statement for Instructors Who Use External Software in Their Course**

This course makes use of Crowdmark for marking exams. Be aware that by logging into the site, you will be leaving onQ, and accessing Crowdmark’s website. Your independent use of that site, beyond what is required for the course (for example, purchasing the company’s products), is subject to Crowdmark’s terms of use and privacy policy. You are encouraged to review these documents, using the link(s) below, before using the site.

- Crowdmark - https://crowdmark.com/privacy/queens/

6. **Accommodations for Disabilities**
If you are a special needs student, and require specific accommodations when writing examinations or quizzes or any other type of assignment, such as requiring more time, you must register with the Disability Services Office located in the LaSalle building on the Queen's campus. The Web site can be found by following the link below.

Accessibility Services website Under "Accommodations" click on "online registration"

Once you receive special accommodations:

- The Exams Office will arrange accommodations for your final exam in April.
- Give a copy of your accommodation form to each of your professors and Garry Rasmussen. gjr6@queensu.ca. Garry will arrange the required accommodations for you for all quizzes and midterm exams, once Garry has been notified by you that you wish to receive accommodations for these evaluations. An email will be sent or a News Item will be posted shortly before-hand asking student with accommodations to confirm they will be writing with accommodations. Responding to confirm that you will be writing with accommodations is required in order to receive those accommodations.

7. Academic Consideration for Students with 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, not to exceed three months. Students receiving academic consideration must meet all essential requirements of a course. The Senate Policy on Academic Consideration for Students in Extenuating Circumstances was approved at Senate in April, 2017 (see 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: William Newstead
Instructor/Coordinator email address: wn1@queensu.ca