Brooklyn College
Department of Chemistry

Quantitative Chemical Analysis, CHEM 3415W Syllabus; Fall 2011


• Some useful resources for students may be found at the publisher’s website: http://bcs.whfreeman.com/qca/

Required Items:  • Scientific calculator,
• Locks for lab drawers × 2
• Dish detergent, roll of paper towels
• Small bound notebook for lab.

Lecture Instructor:  Professor Maggie Ciszkowska
E-mail: malgcisz@brooklyn.cuny.edu
Phone: 718-951-5000 ext. 2828
Room: 3317 Ingersoll

Office Hours:  Tuesday, 2:30 PM – 3:30 PM
Wednesday, 11:00 AM – 11:50 AM
Thursday, 2:30 PM – 3:30 PM

Instructions for all experiments are available on Blackboard

Copies of Lecture Notes are available on Blackboard

Chemistry Office: New Ingersoll Hall, room 359NE, phone extension 5458
Chemistry Department Webpage: http://academic.brooklyn.cuny.edu/chem/index.htm

Department  Prof. Maggie Ciszkowska, Room: 359 NE
Chair  malgcisz@brooklyn.cuny.edu

Department  Prof. Lesley Davenport, Room: 359 NE
Deputy Chair  ldvnport@brooklyn.cuny.edu

Undergraduate  Prof. Brian Gibney, Room: 254 NE
Chemistry Advisor: bgibney@brooklyn.cuny.edu

Learning Objectives:  At the end of this course you should have acquired a solid background in the principles of Quantitative Analysis and should have learned the basics of a range of analytical methods and techniques commonly applied in analytical settings. A further objective is that you learn to evaluate the accuracy and precision of experimental data and use simple statistical methods to assist you in the assessment of analytical problems. While this course will not cover all the material appearing in the recommended textbook, the content of the chapters that have been selected (see below) is largely all exam material unless indicated otherwise.
Homework: It is recommended that you do all Problems and Exercises from your Textbook. Your homework is not collected or graded. However, you are strongly advised to do your homework timely. The homework problems closely resemble the problems given on exams. You are encouraged to do as many problems as you possibly can. Problems marked with an asterisk at the end of each chapter can be found at the back of the textbook. It is a good idea to use a separate homework notebook for all your homework.

Writing Exercises: There will be several lab reports with an extensive writing component. These writing exercises are intended to integrate writing and critical thinking as a tool that should benefit your learning.

Drop Dates: September 15 (Thursday) is the last day to drop a course without a grade. November 17 (Thursday) is the last day to apply for non penalty withdrawal (i.e., W grade). See your lab instructor or the course coordinator for advice. To withdraw, you MUST file a form in the Registrar's Office (either electronically or in person) and go to the stockroom to CHECK OUT from the laboratory.

CUNY policy on Academic Integrity: The faculty and administration of Brooklyn College support an environment free from cheating and plagiarism. Each student is responsible for being aware of what constitutes cheating and plagiarism and for avoiding both. The complete text of the CUNY Academic Integrity Policy and the Brooklyn College procedure for implementing that policy can be found at this site: http://www.brooklyn.cuny.edu/bc/policies. If a faculty member suspects a violation of academic integrity and, upon investigation, confirms that violation, or if the student admits the violation, the faculty member MUST report the violation.

Grading:
Your final grade will be determined as follows:

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Component</th>
</tr>
</thead>
<tbody>
<tr>
<td>35%</td>
<td>3 lecture exams out of 4 exams (the lowest result is dropped)</td>
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<tr>
<td>35%</td>
<td>Laboratory reports (including writing components) and performance</td>
</tr>
<tr>
<td>30%</td>
<td>Final Exam</td>
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Lecture Exams:
- FIRST Lecture Exam: September 15 (Thursday), Coverage TBA
- SECOND Lecture Exam: October 6 (Thursday), Coverage TBA
- THIRD Lecture Exam: November 3 (Thursday), Coverage TBA
- FORTH Lecture Exam: December 8 (Thursday), Coverage TBA

NOTE: NO MAKEUP EXAMS ARE GIVEN FOR LECTURE EXAMS.

FINAL EXAM: December 15 (Thursday), 3:30–5:30 PM, room TBA

Lab Exemptions: Students who are repeating the course may be able to obtain laboratory exemptions. Please fill out a Laboratory Exemption Request form in the Chemistry Department office, 359 NE.
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**Chemistry 3415W Lecture Schedule (8th Edition)**  
*Unless specific sections are indicated, you are responsible for the entire chapter.*

For best results, read the assigned material before lecture.

<table>
<thead>
<tr>
<th>Lecture #</th>
<th>Topics</th>
<th>Assigned Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 2</td>
<td>The nature of analytical chemistry; Apparatus; Units of operation; Simple Calculations; Experimental errors; Statistical treatment.</td>
<td>Chapters 0–3</td>
</tr>
<tr>
<td>3, 4</td>
<td>Confidence intervals; Statistical hypothesis testing; Detection of gross errors; Sampling; Standardization; Calibration</td>
<td>Chapters 4, 5</td>
</tr>
<tr>
<td>5</td>
<td>Lecture Exam 1</td>
<td></td>
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<tr>
<td>6, 7</td>
<td>Chemical equilibrium in aqueous solutions; Chemical activity.</td>
<td>Chapters 6, 7</td>
</tr>
<tr>
<td>8, 9</td>
<td>Equilibrium problems for complex systems, Titration methods.</td>
<td>Chapters 6, 7</td>
</tr>
<tr>
<td>10, 11</td>
<td>Acid-base equilibria; Acid-base titrations</td>
<td>Chapters 8–10</td>
</tr>
<tr>
<td>12</td>
<td>Lecture Exam 2</td>
<td></td>
</tr>
<tr>
<td>13, 14</td>
<td>Acid-base equilibria; Acid-base titrations – Cont.</td>
<td>Chapters 8–10</td>
</tr>
<tr>
<td>15, 16</td>
<td>Buffers; Titration curves for complex acid-base systems</td>
<td>Chapters 8–10</td>
</tr>
<tr>
<td>17, 18</td>
<td>Complexation reactions and titrations; EDTA titration; Advanced topics in Equilibrium</td>
<td>Chapter 11, 12</td>
</tr>
<tr>
<td>19</td>
<td>Lecture Exam 3</td>
<td></td>
</tr>
<tr>
<td>20, 21, 22</td>
<td>Electrochemistry; Electroanalytical methods</td>
<td>Chapters 13–16</td>
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<tr>
<td>23, 24, 25</td>
<td>Fundamentals of spectrophotometry; Instrumentation</td>
<td>Chapters 17–20</td>
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<tr>
<td>26</td>
<td>Lecture Exam 4</td>
<td></td>
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<tr>
<td>27, 28</td>
<td>Introduction to Analytical Separations; Gas Chromatography (GC); Liquid chromatography, HPLC</td>
<td>Chapter 22–24</td>
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<tr>
<td>Dec 16</td>
<td>Final Exam</td>
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Chemistry 3415 Laboratory

SAFETY GOGGLES MUST BE WORN IN THE LABORATORY! The goggles must be indirectly-vented to offer splash protection; direct vented goggles are not suitable. If your instructor observes you violating eye protection or other safety policies, you can be removed from the laboratory and/or given a 10% (or higher) penalty on your laboratory report grade.

Scientific data requires special treatment. It must be recorded in non-erasable ink your lab book immediately after a measurement is taken; partners cannot copy each others’ data at a later time. Altering or copying data outside of the laboratory represents academic dishonesty and will be prosecuted as such if observed. Further, you will receive no credit for any lab report that includes data that are not your own. If your data are messy, you may copy them over onto a final report, but you must include your original data when you turn in your report.

Lab reports are due in lab the week after the experiment was concluded unless you obtain permission from your instructor. All lab reports not handed in will receive a grade of zero.

Schedule of Lab Experiments in Chemistry 3415

All experimental manuals are (or will be) posted on the Blackboard. You have to print them yourself.

Meeting  Laboratory Assignment

Part I:
1  Exp. 1 Check in. Introduction to Analytical Measurements: Weighing, Calibration and Statistical Approach Using Microsoft Excel
2, 3  Exp. 2 Determination of Chloride by the Mohr Method
4, 5  Exp. 3 Determination of Phosphoric Acid Level in Soft Drinks by Potentiometric Titration and Computer Data Analysis
6  Exp. 4 Determination of Zn in a Cold-Relief Lozenge Medication by EDTA Complexometric Titration
7  Exp. 5 Spectrophotometric Determination of Iron
8, 9  Exp. 6 Determination of Iron in an Ore Sample by Oxidation-Reduction Titration

Part II: experiments are performed in groups
10 Flame Photometry: Determination of Sodium and Potassium in an Unknown Sample
11 Gas Chromatography: Analysis of a Mixture of Organic Compounds
12 Cyclic Voltammetry: Dependence on the Concentration of an Analyte; Determination of the Concentration of an Iron Complex
13 UV-vis Spectroscopy: Determination of a Composition of Two-Component Mixture
14 Check out. NO WORK PERMITTED