

Brooklyn College
Department of Chemistry

Quantitative Chemical Analysis, CHEM 3415W Syllabus; Fall 2015

<u>Required Texts:</u>	<ul style="list-style-type: none">• <i>Quantitative Chemical Analysis</i>, Daniel C. Harris, 8th Edition; W.H. Freeman and Company, New York.• Some useful resources for students may be found at the publisher's website: http://bcs.whfreeman.com/qca/
<u>Useful Website</u>	http://www.whfreeman.com/qca7e
<u>Required Items:</u>	<ul style="list-style-type: none">• Scientific calculator (bring to each lecture and lab),• <u>Locks</u> for lab drawers × 2 (bring to the first lab!)• Dish detergent, roll of paper towels• Small bound notebook for lab.
<u>Lecture Instructor:</u>	Professor Maggie Ciszowska E-mail: malgcisz@brooklyn.cuny.edu Phone: 718-951-5458; <i>Chemistry Office</i> Room: 359 NE (Ingersoll Add.); <i>Chemistry Office</i>
<u>Office Hours:</u>	Tuesday, 2:30 PM – 3:30 PM <i>and by appointment</i>
Chemistry Department Webpage:	http://academic.brooklyn.cuny.edu/chem/index.htm
<u>Department Chair</u>	Prof. Maggie Ciszowska, Room: 359 NE (Chemistry Office) malgcisz@brooklyn.cuny.edu
<u>Undergraduate Chemistry Advisor:</u>	Prof. Emilio Gallicchio, 3316 N (Ingersoll Hall) egallicchio@brooklyn.cuny.edu

Course Goals: Scientists from all disciplines rely the detailed chemical analyses of samples. This course will provide you with both theoretical and practical instruction in the fundamental principles of quantitative chemical analysis. Through both lecture and laboratory instruction, you will become proficient in how to perform the range of methods and techniques that are commonly applied in analytical settings. Furthermore, you will be instructed in the use of simple statistics to evaluate the precision and accuracy of your measurements. This knowledge will aid you in assessing experimental data, make you more adept at designing critical experiments, and will serve as your foundation for future work involving instrumental techniques.

Assignments: It is your responsibility to do exercises and problems at the end of each chapter. The answers may be found in the back of the book or in the solutions manual. Homework is not collected or graded, however professionalism demands that you keep current with the homework and reading assignments. The homework will serve as an indication as to the type and level of difficulty of the questions/problems that you will find on the exams.

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.

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Drop Dates: Wednesday September 16 is the last day to drop without a grade of "W".

Monday, November 9 is the last day to apply for non penalty withdrawal (*i.e.*, W grade). See your lecture instructor 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:

35%	4 lecture exams (average grade)
35%	Laboratory reports (including writing components) and performance
30%	Final Exam

Lecture Exams:

- **FIRST** Lecture Exam: **September 3 (*Thursday*)**, Coverage TBA
- **SECOND** Lecture Exam: **October 1 (*Thursday*)**, Coverage TBA
- **THIRD** Lecture Exam: **October 27 (*Tuesday*)**, Coverage TBA
- **FOURTH** Lecture Exam: **December 3 (*Thursday*)**, Coverage TBA

NOTE: NO MAKEUP EXAMS ARE GIVEN FOR LECTURE EXAMS.

FINAL EXAM: December 22 (*Tuesday*), 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.

Other important dates:

September 10, Thursday, **CONVERSION DAY**, classes follow a **Monday** schedule

September 22-23, Tuesday-Wednesday, **NO CLASSES**

September 25, Friday, **CONVERSION DAY**, classes follow a **Tuesday** schedule

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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.

Topics	Assigned Reading
Simple Calculations in analytical chemistry; The nature of analytical chemistry; Apparatus; Units of operation; Experimental errors; Statistical treatment.	Chapters 0–3
Confidence intervals; Statistical hypothesis testing; Detection of gross errors; Sampling; Standardization; Calibration	Chapters 4, 5
Chemical equilibrium in aqueous solutions; Chemical activity.	Chapters 6,7
Equilibrium problems for complex systems.	Chapters 6,7
Acid -base equilibria; Acid-base titrations	Chapters 8–10
Acid -base equilibria; Acid-base titrations – <i>Cont.</i>	Chapters 8–10
Buffers; Titration curves for complex acid-base systems	Chapters 8–10
Complexation reactions and titrations; EDTA titration; Advanced topics in Equilibrium	Chapter 11, 12
Electrochemistry; Electroanalytical methods	Chapters 13–16
Fundamentals of spectrophotometry; Instrumentation	Chapters 17–20
Introduction to Analytical Separations; Gas Chromatography (GC); Liquid chromatography, HPLC	Chapter 22–24

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Chemistry 3415 Laboratory

Laboratory: Laboratory attendance is obligatory and you are strongly advised to be punctual and to maintain a neat laboratory notebook.

Safety: **SAFETY GOGGLES MUST BE WORN IN THE LABORATORY AT ALL TIMES!**

The goggles must be indirectly-vented to offer splash protection. If you violate the eye protection or other safety policies, you will be removed from the laboratory and given at least a 10% deduction in your laboratory report grade. No exceptions. **You will be provided goggles in your lab kit.**

Notebook: A laboratory notebook is legal document and must be respected as such. In industry, or an academic laboratory, the notebook belongs to the company or institution not to the scientist and can't be taken out of the laboratory. Scientific data must be recorded in non-erasable ink in your laboratory notebook immediately after a measurement is taken. Take care to be neat when recording your data, because you must include your original data when you turn in the report. Lab partners can't copy each other's data at a later time. Altering or copying data outside the laboratory is academic dishonesty and will be dealt with as such.

Lab Reports: Each lab instructor will inform you when lab reports are due. Several of the lab reports involve extensive writing components intended to integrate writing and critical thinking into your learning process. All lab reports not handed in on time will receive a grade of zero.

Schedule of Lab Experiments in Chemistry 3415W

All **experimental manuals** will be e-mailed to you as pdf files.

You have to **PRINT THEM YOURSELF.**

Meeting Laboratory Assignment

Part I: *Individual assignments*

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

Part II: *Experiments are performed in groups*

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| 10 | <i>Exp. 7:</i> Flame Photometry: Determination of Sodium and Potassium in an Unknown Sample |
| 11 | <i>Exp. 8:</i> Gas Chromatography: Analysis of a Mixture of Organic Compounds |
| 12 | <i>Exp. 9:</i> Cyclic Voltammetry: Dependence on the Concentration of an Analyte; Determination of the Concentration of an Iron Complex |
| 13 | <i>Exp. 10:</i> UV-vis Spectroscopy: Determination of a Composition of Two-Component Mixture |
| 14 | <u>Check out.</u> NO WORK PERMITTED |