Lehman College Chemistry Department's 2020 Self-Study Report

Prepared by the Self-Study Report Committee:
Assoc. Prof. Naphtali O'Connor (committee chairperson)
Assist. Prof. Melissa Deri
Assist. Prof. Benjamin Burton-Pye
Prof. Andrei Jitianu (*ex-officio*)

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Chapter 1

Introduction to Lehman College and the Department of Chemistry

> *Lehman College serves the Bronx and surrounding region as an intellectual, economic, and cultural center. Lehman College provides undergraduate and graduate studies in the liberal arts and sciences and professional education within a dynamic research environment, while embracing diversity and actively engaging students in their academic, personal, and professional development.*
>
> *Lehman College Mission Statement*

Lehman College

Herbert H. Lehman College – a Carnegie-classified Master's Colleges & Universities: Larger Programs – is the only public senior college in the Bronx. Lehman College is part of The City University of New York, which is comprised of eleven senior colleges, seven community colleges, and seven honors, graduate and professional schools. The College was established in the present form on July 1, 1968, after existing since 1931 as the Bronx branch of Hunter College, known as Hunter- in-the-Bronx. It is named for Herbert H. Lehman, former Governor of New York State, U.S. Senator, and internationalist. His values of dedicated public service, commitment to human rights, and support for immigrants are embodied in many of the College's programs and initiatives today.

In the decades that followed its founding, Lehman – located on a 37-acre tree-lined campus – continually evolved in response to the end of free tuition at CUNY, and a changing social, political, and economic landscape. As a consequence, it ably endured the iconic student protests of the late 1960s and 1980s, as well as New York City's fiscal crisis of the mid-1970s, which resulted in faculty retrenchment and reduced capital investment in college campuses. Today, as described in ensuing sections, the College is energized and ready to redouble its efforts to respond to the very real environmental, economic, and social challenges of the day.

New York State and CUNY have invested heavily in the College's physical footprint including: opening of Carman Hall, Lehman's principal classroom building (1971); Lehman Center for the Performing Arts (1980); and the Multimedia Center (2010). These are complemented by the Art building (1959), Leonard Lief Library (1980), and APEX gymnasium (1994).

The original campus core consists of the neo-Gothic towers and tree-lined walkways that resonate to in 1946 when it served for six months as the interim headquarters for the newly formed United Nations. The College has made recent changes with Science Hall, the College's state-of-the art research and teaching facility, debuted in 2012. In 2013, in recognition of the needs of the College's distinctive student body, the Child Care Center was inaugurated in a separate building. The largest ongoing project is a $64 million, 50,000 square- foot Nursing Education, Research, and Practice Center.

Student Population and Academic Programs: Since 2016, the College has experienced growth in both enrollment and degrees awarded. With over 81,000 alumni – more than half remaining in the community and region, giving back and strengthening their communities as financial analysts, health care professionals, information technology practitioners, social workers, teachers, and elected officials – Lehman currently enrolls nearly 15,000 undergraduate and graduate students, its largest enrollment in over 40 years. Moreover, 3,194 degrees were awarded in 2018, double the number awarded two decades prior.

Lehman College offers 140 degree programs with a firm foundation in liberal arts and sciences that include 76 undergraduate majors and programs and 64 graduate degree programs. Lehman also offers 33 graduate certificates. Currently, the five undergraduate majors with the highest number of declared students include Nursing (946), Business Administration (857), Psychology (772), Sociology (630), and Health Services Administration (588). Lehman's degree programs respond to the College's core identity as a liberal arts institution committed to developing in students the critical skills and competencies they need for sustained, successful careers in the constantly changing 21st century workplace, as well as function as responsible global citizens. To this end, Lehman has invested in technology and multimedia resources, providing equipment, support, and professional development and certification for web- enhanced instruction in the traditional classroom and for hybrid/online courses and programs.

Characteristics of Lehman's undergraduate and graduate students (2017): (1) Of 11,978 undergraduates, 52.5% are Hispanic, 30.3% are Black, and 6.9% are Asian. Sixty-eight percent are women. The average age is 26. (2) Of 2,152 graduate students, 34.7% are Hispanic, 31.2% are Black, and 6.7% are Asian. The average age is 34. (3) Six in ten undergraduates are enrolled full-time. Forty-nine percent of undergraduate students are first-generation. (4) Nearly 60% (58.9%) of undergraduate students and 43% (42.5%) of graduate students reside in the Bronx.

Lehman College is committed to success of its ethnically and socially diverse student population, providing optimal advising, education, and opportunity for students across the enrollment spectrum – from Search for Education, Elevation, and Knowledge (SEEK) to Honors students, from first-year through transfer majors to graduate students.

Recently Lehman College was deemed as the college with the 4th highest mobility rate in the nation.[1] Based on that in 2017, the Lehman College launched "**The 90x30 Challenge**", a bold initiative designed to increase educational attainment in the Bronx by awarding 90,000 or more degrees and credentials from the beginning of the initiative through 2030.

Pivotal to providing these offerings are Lehman's 1,549 employees, consisting of 956 faculty (full-time and part-time) and 593 staff. The College's nationally recognized faculty, which includes five Distinguished Professors, reside in the College's five Schools – Arts and Humanities; Continuing and Professional Studies; Education; Health Sciences, Human Services, and Nursing; Natural and Social Sciences – where they serve as scholar-teachers, engaging with students in the latest disciplinary research and analysis.

Lehman takes great pride in the diversity as well as productivity of its faculty. Roughly 37% of full-time faculty are faculty of color, which represents a 10% increase in the proportion of full-time faculty of color since 2010.

In addition to its matriculated student population (including Adult Degree students), Lehman serves 13,000 students through its School of Continuing and Professional Studies (SCPS). The School offers 33 high-quality certificates and licenses. Its programs include an Innovation Lab, Small Business Development Center, ESL training, and education labs for high school students.

[1] http://www1.cuny.edu/mu/forum/2017/01/24/lehman-college-ranked-no-4-in-mobility-rate-for-students-in-the-u-s/

This programming reflects Lehman's commitment to educational attainment in its home community, throughout the cradle-to-career pipeline, one of many factors that makes the College an anchor institution in the Bronx.

The College's goals and institutional priorities are geared toward strengthening its contributions to the advancement of CUNY's stated mission, which reads in part:

> *"...[T]he University will continue to maintain and expand its commitment to academic excellence and to the provision of equal access and opportunity ... The City University is of vital importance as a vehicle for the upward mobility of the disadvantaged in the City of New York."*

The College is experiencing a period of growth and development that is aligned with it's mission and the mission of CUNY as a whole:

• **Access and Opportunity:** The Fall 2017 full-time freshman class (919) was Lehman's largest in nearly a decade, transfer student enrollment rose slightly, and total student enrollment was the largest since 1976 when CUNY's free tuition policy was discontinued. **Moreover, in the four years between Fall 2013 and Fall 2017, the number of undergraduate STEM majors grew by 96%, the highest rate in all of CUNY.** Nearly 22% (21.9%) of Lehman's instructional full-time equivalents are taught either partially or fully online, the highest percent of any college in the system and more than double the senior college average (10.6%).

• **Retention and Graduation Rates:** The proportion of first-time, full-time freshmen who returned as full-time students (79.5%) in Fall 2017 outpaced the senior college average (69.9%) by almost ten points. The six-year graduation rate for the first-time, full-time freshmen 2011 cohort increased 8.6% compared to the Fall 2007 cohort (45.6% vs. 37%), the largest growth rate of any CUNY senior college during this period. The four-year graduation rate of students who transferred to Lehman from a CUNY Associate degree program in Fall 2013 was 58.3%, 7.5 percentage points higher than the CUNY average (50.8%).

• **Financial Health:** In 2017, Lehman registered a five-year high in spending of its tax levy budget on student services, instruction, and department-level research (69.5%). Between FY2013 and

FY2017, the number of funded research grants increased from 16 to 39. In addition, the amount of private financial support received by the College during that period grew 84.4% from $5.7M to $10.7M. Recent investments (November 2018) include a $4.2 million award from the Robin Hood Foundation to support 250 students in the new Accelerate, Complete, Engage (ACE) completion program, starting in Fall 2019 with the goal of achieving 50% four-year graduation rates for freshmen and transfers with Associate degrees. In January 2021 Lehman College received a $30 million gift from philanthropist, author and activist MacKenzie Scott. This is the largest single gift in the college's history and one of the largest in the history of The City University of New York (CUNY).

• **Public-Private Partnerships:** Lehman opened the first Virtual and Augmented Reality Academy and Lab in the region with Eon Reality, and received a major grant from the Economic Development Corporation to provide additional workforce development as part of a three-year partnership with New York University.

• **Value:** Forbes recently set out to identify "the schools where grads owe the least relative to their likely mid-career income." **Lehman was one of only four public colleges to rank in the top 25 "low-debt/high-income schools."**

• **Social Mobility:** According to the American Council of Education, Lehman has the highest extended mobility rate, measured as the fraction of students who come from families in the bottom two income quintiles and end up in the top two quintiles as adults, among all Hispanic-serving institutions. Similarly, recent data from National Bureau of Economic Research and the Equality of Opportunity Project ranked Lehman as having the third highest mobility rate in the nation among Hispanic-Serving Institutions (HSIs).

Chemistry at Lehman College

The Department of Chemistry was established with the formation of the New Senior College at Lehman. At its peak it had 15 full time faculty and during this time the department thrived. However, in the late 80's and early 90's there was restructuring within the college and this had a major impact on the department. At the lowest moments the number of faculty in the department declined through retirement and at one time it was as low as three full time faculty.

An effort was made to re-invigorate the department by the hiring of a chairperson. This was done in 2006 and again in 2010. Both left shortly after their appointments and the department hired a 3rd chair in Prof. Pamela Mills in 2014. During this time the department had added new faculty or replaced retirement lines to a total of 5 faculty members hired between 2008 and 2012. In the same period a new full-time laboratory technician was hired. Subsequent to Prof. Mills' hiring as chair, an addition 4 faculty members were hired as well as 2 retirements. The department now boasts 11 full-time faculty members and 4 full-time laboratory technicians. Prof. Mills was recently appointed Interim Dean of the School of Natural and Social Sciences (NSS) in 2018, and subsequent to her departure the department elected Prof. Andrei Jitianu as Chair.

In addition to the changes in personnel, the department has made improvements and investments on the educational and research fronts. The New Science Building was dedicated in October 2012 and hosted its first classes in the spring semester of 2013. This $70 million, 69,000 sq. ft. building features a blend of teaching, research, and administrative space. It is designed to promote collaboration among scientific disciplines and at the same time integrate teaching with research to increase undergraduate engagement with current research projects. General Chemistry labs were moved to this building and it currently hosts the research labs of Prof. Mallikaratchy and Prof. de la Parra. The investment in new appointments has paid off with vast increase in students exposed to research. The faculty has been quite successful in obtaining external funding which includes grants from the National Institute of Health (NIH) and the National Science Foundation (NSF). Prof. Kurtzman recently received one of the colleges only R01 grants from the NIH. The Chemistry department have been involved in several institutional grants. Prof. Lopez is a co-PI on an NSF CREST grant that provides funding opportunities for graduate students in collaboration with City College. Spearheaded by chemistry faculty, the College recently received a NIH RISE, which

provides research opportunities for undergraduates and helps train them in the methodology of research. Prof. Mills brought from Hunter College her vast experience and success in education research and grant funding. All of these successes have totaled to $12,915,577 in grant funding to department faculty from 7/11/2012 to 9/20/2019.

On the educational front, the department has redesigned its Chemistry degrees to consist of two B.A. and two B.Sc. degrees in concentrations in Chemistry or Biochemistry. The newly developed Chemistry B.A. with a concentration in Biochemistry was designed to provide the foundational underpinnings of a degree in chemistry while being attractive to Pre-health students. This new degree sequence has directly helped in raising the profile of the College as a whole, and has specifically been linked with Lehman's recent ranking as #16 "best pre-med programs in the country"[2]

This has revitalized the department with the number of majors on the rise and increasing enrollment in upper level courses. Chemistry majors have increased more than 300% from 35 students in 2012 to 113 in 2018. The growth continue in such a way that in November 2020 we were able to report a number of 150 majors. The department has also looked to improve how introductory courses are taught and has adopted a flipped model in General Chemistry courses. This has boosted the passing rate to >80% and has also contributed to attracting students to the chemistry major. This, combined with the NSS PTS[3] grant, has allowed the chemistry department to provide increased in-class support for our General, Organic and Biochemistry classes, addressing educational bottlenecks and promoting student success.

The departments educational and research efforts have also lead to an increase in the number of graduate students and as of December 2020 there were 17 graduate students based at Lehman College. Our faculty are also actively involved in teaching, dissertation committees and graduate level examination panels at the CUNY Graduate Center.

The Department has certainly experienced a period of unprecedented growth and success due to our program offerings and faculty expertise. We are striving to keep the momentum going without compromising educational and research quality.

[2] https://www.onlinecollegeplan.com/rankings/best-premed-colleges/

Vision and Goals of the College

Lehman has always been a commuter campus that prides itself on its diversity and commitment to multicultural understanding. The College has begun to provide a residential experience to attract a wider range of students and lead to the development of new learning communities to enhance student success. The Strategic Planning Council (SPC) solidified the mission and goals for the College in January 2010 when they published the strategic direction for 2010 – 2020. The report entitled 'Achieving the Vision' outlines the following 4 institutional goals and codified a series of objectives aligned towards achieving those goals:

GOAL 1: Excellence in Teaching, Research and Learning

- **Objective 1.1:** Recruit, support and retain distinguished faculty.
- **Objective 1.2:** Support existing academic programs and develop new programs of exceptional quality informed by a rigorous review process.
- **Objective 1.3:** Achieve greater external recognition and success of academic programs.
- **Objective 1.4:** Enhance existing facilities, promote the efficient use of space, and ensure a well-maintained campus environment that supports teaching, research, learning and quality of life.

GOAL 2: Enhanced Student Success

- **Objective 2.1:** Recruit well-prepared, promising and motivated students of diverse ethnicities and cultures consistent with the college's mission.
- **Objective 2.2:** Strengthen academic resources and student support services.
- **Objective 2.3:** Enhance student experience and life on campus

GOAL 3: Greater institutional and Financial Effectiveness

- **Objective 3.1:** Integrate institutional planning and assessment to improve effectiveness.

- **Objective 3.2:** Strengthen existing sources of revenue support and create new sources for student and faculty research and outreach programs.
- **Objective 3.3:** Increase visibility and alumni engagement.

GOAL 4: Commitment to engagement and community Service

- **Objective 4.1:** Enrich the community through increased engagement of the College's resources.
- **Objective 4.2:** Improve the health and educational well-being of the community.
- **Objective 4.3:** Contribute to the economic vitality of the Bronx and surrounding region.

Vision and Goals of the Department

Being centered in the Bronx, a major goal of the Chemistry Department is to elevate students from the Bronx, a largely minority and low-income population, to the middle class through a rigorous course of study in Chemistry. This goal is aligned with the current mission of the institution. To achieve this goal, all members of the department are intellectually and actively engaged in the teaching and scholarship missions of the department. The Chemistry Department participates in the doctoral program and most members of the department are also on the graduate faculty. All department members balance teaching and research, although opportunities for faculty members to focus more on research are available if the faculty members obtain significant external grant funding.

The Department's vision is informed by three broad national models of departmental or institutional function: a research-centric model, an under-grad centric model (liberal arts), and a teaching-centric model. The Lehman College Chemistry Department aspires to be an outstanding undergrad centric model with opportunities for doctoral research. To be undergrad-centric for our population we have two duties: a) **open gates:** ensure that the gates to STEM are open (innovate and successful models in GChem and OChem) and b) **career preparation:** ensure that there are no limits to student success – students have access to meaningful research experiments (faculty labs and internships) and rigorous

course experiences (advanced courses) that prepare students appropriately for graduate work or careers.

Chapter 2

Program Goals and Learning Objectives

The Lehman College Chemistry department believes in a standard set of chemistry skills that all chemistry majors will acquire as they progress through their required chemistry major courses. These skills are called learning objectives and are tied to our main Program Goals. The Program Goals provide the overview of the Department's mission, while the Specific Learning Objectives are the skills required to realize these outcomes.

Chemistry Program Goals:

- To encourage the development of a broad foundation in Chemistry. One that stresses fundamental chemical principles built through a combination of scientific reasoning and problem solving, and how these principles apply to everyday life.
- To provide students with the skills that they need to succeed in graduate programs, professional school or chemistry related careers.
- To expose students to a wide range of experimental techniques and analytical instrumentation.

Specific Learning Objectives:

Upon completion of a bachelor's degree in chemistry, Lehman College graduates will be able to:

1. Recognize the nature of matter and its transformation from one form into another.
2. Represent chemical substances using formulas, chemical reactions using chemical equations and consider possible reaction mechanisms.
3. Use the principles of thermodynamics to explain the behavior of chemical systems.
4. Integrate mathematics and physics knowledge in solving complex chemical problems using equations that may contain unknown variables.
5. Recognize the underlying chemical principles of life and apply these to biological systems.
6. Collect measurable chemical data in a laboratory setting.
7. Assess the accuracy and precision of measurements using mathematical and statistical analysis.
8. Represent, analyze and interpret complex and integrated chemical data.
9. Effectively convey chemical knowledge in both written and oral form.
10. Collaborate effectively as part of a group to solve chemical problems, engage in conversations about chemistry and value other people's opinions.
11. Be aware of the ethical principles and professional conduct associated with chemical research and professional positions.

Curriculum

The department of chemistry runs 4 major programs and 1 minor program at the undergraduate level. The majors are: a Bachelor of Science in Chemistry, a Bachelor of Science in Chemistry with a specialization in Biochemistry, a Bachelor of Arts in Chemistry and a Bachelor of Arts in Chemistry with a specialization in Biochemistry. The format and composition of our majors are shown within the program descriptions along with the recommended completion path.

Chemistry Degree Programs

The aims for the programs we offer are slightly different.

BS in Chemistry

Our ACS-accredited BS in Chemistry. This major is recommended for students preparing for graduate school in chemistry or for careers in chemical research. The BS program is accredited by the Committee on Professional Training of the American Chemical Society (ACS).

Y1 Fall	Y1 Spring	Y2 Fall	Y2 Spring	Y3 Fall	Y3 Spring	Y4 Fall	Y4 Spring
		CHE 232	CHE 234				
CHE 166	CHE 168	CHE 233	CHE 235	CHE 249		CHE 442	
CHE 167	CHE 169	PHY 168	PHY 169	CHE 342	CHE 344	CHE 444	
MAT 175	MAT 176	MAT 226	CHE 450**	CHE 345	CHE 347	CHE 449	CHE 443

BA in Chemistry

This major is recommended for students preparing for certification as secondary teachers in chemistry or positions in the chemical industry.

Y1 Fall	Y1 Spring	Y2 Fall	Y2 Spring	Y3 Fall	Y3 Spring	Y4 Fall	Y4 Spring
					CHE 344		
			CHE 234	CHE 249	CHE 347		
CHE 166	CHE 168	CHE 232	CHE 235	PHY 166	PHY 167		
CHE 167	CHE 169	CHE 233	MAT 226	or	or	CHE 342	CHE
(MAT 172)	MAT 175	MAT 176	CHE 450**	PHY 168	PHY 169	CHE 345	ELECTIVE*

BS in Chemistry with a specialization in biochemistry

This major prepares students for i) graduate studies in biochemistry, molecular biology immunochemistry, pharmacology or clinical chemistry and ii) careers in biochemistry or biomedicine in hospitals, medical school or in the chemical in industry. The BS program in biochemistry is accredited by the Committee on Professional Training of the American Chemical Society (ACS).

Y1 Fall	Y1 Spring	Y2 Fall	Y2 Spring	Y3 Fall	Y3 Spring	Y4 Fall	Y4 Spring
		CHE 232	CHE 234				
		CHE 233	CHE 235				
CHE 166	CHE 168	PHY 168	PHY 169			CHE 432	
CHE 167	CHE 169	MAT 226	BIO 167	CHE 249	CHE 446	CHE 345	CHE 344
MAT 175	MAT 176	BIO 166	CHE 450**	CHE 444	CHE 447	CHE 442	CHE 443

BA in Chemistry with a specialization in biochemistry

This major is recommended for students preparing for professional training in medicine, dentistry and other health-related sciences.

Y1 Fall	Y1 Spring	Y2 Fall	Y2 Spring	Y3 Fall	Y3 Spring	Y4 Fall	Y4 Spring
					CHE 446		
		CHE 232	CHE 234	CHE 444	CHE 447		
CHE 166	CHE 168	CHE 233	CHE 235	PHY 166	PHY 167		CHE 344
CHE 167	CHE 169	BIO 166	BIO 167	or	or	CHE	or
(MAT 172)	MAT 175	MAT 176	CHE 450**	PHY 168	PHY 169	ELECTIVE*	CHE 342

* ONE 3 credit (or more) elective chemistry course at the 200 level or above (excluding CHE 391 & CHE 491) must be chosen and can be taken in the Spring or Fall semesters of years 3 or 4.

** CHE 450 can be taken in any semester and is a required course for students who do departmental research.

The Chemistry Minor.

A minor in chemistry can be obtained by completing the first 2 years of chemistry (CHE 166 – CHE 235), CHE 450 and one more chemistry course from the following choices: CHE 244, 249, 432, 344 or 442.

Chemistry-related Degree Programs

In addition to the majors and minor offered by the chemistry department, we also participate in a number of other degree programs that have course requirements in chemistry. These include:

- BS in Anthropology, Biology and Chemistry
- BA degrees in biology
- BS in Nursing
- BS in Dietetics, Foods and Nutrition
- BS in Environmental Science

Brief descriptions of chemistry courses

This information is taken from the college undergraduate bulletin 2019-2021. This can be found at http://lehman.smartcatalogiq.com/en/current/Undergraduate-Bulletin/Courses/CHE-Chemistry. Syllabi for courses currently running are included at the end of this section.

Courses that currently run as part of our major programs and includes and pre-or co-requisites related to this course. (C = credits, H = hours)

CHE 166 General Chemistry I: Fundamental laws and theories of chemistry. (C:4, H:4).
Requirement Designation Required Core - Life and Physical Sciences
Offered: Fall-Spring
Prerequisite: PRE OR COREQ: MAT 172 or satisfaction of requirements for placement into calculus I (MAT 175).

CHE 167 General Chemistry Laboratory I: Introduction to the practical aspects of chemical principles, with emphasis on quantitative measurements and analytical technique. (C:1.5, H:3).
Requirement Designation Required Core - Life and Physical Sciences
Offered: Fall-Spring
Prerequisite: PRE or COREQ: CHE 166.

CHE 168 General Chemistry II: An in-depth introduction to thermodynamics, redox reactions, electrochemistry and chemical equilibrium. (C:4, H:4).
Requirement Designation Required Core - Life and Physical Sciences
Offered: Fall-Spring
Prerequisite: CHE 166.

CHE 169 General Chemistry Laboratory II: Continuation of CHE 167. Emphasis will be on inorganic preparation, ionic separation, and qualitative analysis. (C:1.5, H:3).
Requirement Designation Required Core - Life and Physical Sciences
Offered: Fall-Spring
Prerequisite: CHE 167. PRE or COREQ: CHE 168.

CHE 232 Organic Chemistry Lecture I: Study of the structure and properties of the fundamental classes of organic compounds, with emphasis on reactivity, reaction mechanisms, synthesis, and stereochemistry. (C:4, H:4).
Requirement Designation Regular Liberal Arts
Offered: Fall-Spring
Prerequisite: CHE 168 and CHE 169; Corequisite: CHE 233.

CHE 233 Organic Chemistry Laboratory I: Study of organic synthesis and laboratory techniques, including the use of modern instrumentation and organic qualitative analysis.
(C:2, H:4).
Requirement Designation Regular Liberal Arts
Offered: Fall-Spring
Prerequisite: CHE 168 and CHE 169; Corequisite: CHE 232.

CHE 234 Organic Chemistry Lecture II: Continuation of CHE 232. (C:4, H:4).
Requirement Designation Regular Liberal Arts
Offered: Fall-Spring
Prerequisite: CHE 232; Corequisite: CHE 235.

CHE 235 Organic Chemistry Laboratory II: Continuation of CHE 233. (C:2, H:4).
Requirement Designation Regular Liberal Arts
Offered: Fall-Spring
Prerequisite: CHE 233; Corequisite: CHE 234.

CHE 249 Quantitative Analysis: Fall term only. Principles of gravimetric, volumetric, and spectrophotometric analysis. Methods involving acidimetry, precipitation, chelation, oxidation, and iodometry. Analytical separations. (C:5, H:6).
Requirement Designation Regular Liberal Arts
Offered: Fall
Prerequisite: CHE 168 and CHE 169.

CHE 342 Physical Chemistry Course in Quantum Chemistry: Molecular theory of chemistry with principles and applications including quantum mechanics, molecular structure and spectroscopy. (C:3, H:3).
Requirement Designation Regular Liberal Arts
Offered: Fall
Prerequisite: CHE 168, PHY 169, and MAT 176.
Cross Listed Courses: LEH CHE 332/CHE 342

CHE 344 Physical Chemistry Course in Kinetics and Thermodynamics: Selected topics drawn from thermodynamics, states of matter, statistical thermodynamics and kinetics with an emphasis on the relation between experiment and theory. (C:3, H:3).
Requ*irement Designation Regular Liberal Arts*
Offered: Spring
Prerequisite: CHE 168, PHY 169, and MAT 176.

CHE 345 Physical Chemistry Laboratory in Quantum Chemistry: Experimental work employing important techniques in Quantum Chemistry and/or Spectroscopy. (C:2, H:4).
Requirement Designation Regular Liberal Arts
Offered: Fall-Spring
Prerequisite: CHE 249; PRE or COREQ: CHE 342.

CHE 347 Physical Chemistry Laboratory in Kinetics and Thermodynamics: Experimental work employing important techniques in Kinetics and/or Thermodynamics. (C:2, H:4).
Requirement Designation Regular Liberal Arts
Offered: Fall-Spring
Prerequisite: CHE 249. PRE or COREQ: CHE 344.

CHE 391 Chemical Investigations: A course designed to allow qualified students to participate in original chemical investigation under the supervision of a faculty member. A written report is required each semester. (C:1-3 (maximum 9 credits); H: 1-3 (maximum 9 hours)).
Requirement Designation Regular Liberal Arts
Offered: Fall-Spring
Prerequisite: Department Permission required.
Notes: The total credits received for CHE 391 may not exceed 9.

CHE 442 Inorganic Chemistry: Study of inorganic chemical principles including relevant concepts of bonding, intermolecular forces, acid- base behavior, and reduction-oxidation properties. Chemistry of the main group elements along with transition metals and their complexes. (C:3, H:3).
Requirement Designation Regular Liberal Arts
Offered: Fall-Spring
Prerequisite: CHE 234.

CHE 443 Advanced Inorganic Chemistry: Advanced studies in modern inorganic chemical theories on the interpretation and explanation of the properties, and relations between the elements, their compounds and structures. (C:5, H:8 (2, lecture; 6, lab)).
Requirement Designation Regular Liberal Arts
Offered: Fall-Spring
Prerequisite: CHE 235 and CHE 442; PRE or COREQ: CHE 249.

CHE 444 Biochemistry I: (Closed to students who have taken CHE 244.) Fall term only. Study of amino acids, protein structure and conformation, kinetic and molecular basis of enzyme action, lipids, and membrane structure, carbohydrates and intermediary metabolism, regulatory mechanisms, elementary thermodynamics in biochemical equilibria, and relationships between structure and function of biological macromolecules. (C:3, H:3).
Requirement Designation Regular Liberal Arts
Offered: Fall
Prerequisite: CHE 234.

CHE 446 Biochemistry II: A continuation of CHE 444. Study of photosynthesis, biosynthetic pathways, structure and reactivity of nucleic acids, regulation of gene expression, active transport, mechanism of muscle contraction, and immunochemistry. (C:3, H:3).
Requirement Designation Regular Liberal Arts
Offered: Spring
Prerequisite: CHE 444.

CHE 447 Biochemistry Laboratory: Spring term only. Techniques for the study of large molecules of biological importance; physical and chemical methods of isolation, characterization, structure determination, sequence, and biosynthesis of macromolecules; and kinetics and mechanism of enzyme-catalyzed reactions. Laboratory work will include the application of the following methods to the study of biological molecules: spectrophotometry, chromatography (thin layer, ion exchange, and column), gradient centrifugation, electrophoresis, and radiochemical assays. (C:3, H:6).
Requirement Designation Regular Liberal Arts
Offered: Spring
Prerequisite: CHE 335 and 446.
Notes: Credit may not be received for both CHE 447 and CHE 245.

CHE 449 Instrumental Analysis: Electroanalytical, spectrophotometric, chromatographic, and other instrumental methods as applied to analytical chemistry. (C:5, H:8 (2, lecture; 6, lab)).
Requirement Designation Regular Liberal Arts
Offered: Fall
Prerequisite: CHE 344 and CHE 345.

CHE 450 Chemistry Seminar: Topics of interest in chemistry and biochemistry are presented by members of the scientific community. (C:1 (May be repeated for a total of 4 credits.), H:1).
Requirement Designation Regular Liberal Arts
Offered: Fall-Spring
Prerequisite: CHE 168 or CHE 232.

CHE 491 Chemical Research: This course is designed to enable the advanced student to pursue an investigation of a topic of common interest to the student and a faculty member of the Department. A written research report is required each semester. (C:1-3 (maximum 9 credits); H: 1-3 (maximum 9 hours)).
Requirement Designation Regular Liberal Arts
Offered: Fall-Spring
Prerequisite: Department Permission required.
Notes: Satisfactory completion of 3 credits of CHE 491 is one of the requirements for Departmental honors and it is highly encouraged that students complete at least 1 semester of CHE 391 before requesting permission to register for CHE 491. The total credits received for CHE 491 may not exceed 9.

Chemistry courses not part of the chemistry majors but taught by the chemistry department

CHE 114 Essentials of General Chemistry Lecture: Essentials of chemistry and their applications to inorganic chemistry. (C:3; H:3).
Requirement Designation Required Core - Life and Physical Sciences
Offered: Fall-Spring Online and in-person
Prerequisite: MAT 104 or satisfaction of requirements for placement into precalculus (MAT 172).

CHE 115 Essentials of General Chemistry Laboratory: Introduction to laboratory experimentation to familiarize students with scientific measurements and practical chemical reactions. (C:1.5; H:3).
Requirement Designation Required Core - Life and Physical Sciences
Offered: Fall-Spring
Prerequisite: CHE 114.
Notes: This course satisfies either Life & Physical Science or Scientific World requirement in the CUNY 2013 Gen Ed requirements at Lehman.

CHE 120 Essentials of Organic Chemistry Lecture: Essentials of organic chemistry and their application to biochemistry. (C:3; H:3).
Requirement Designation Regular Liberal Arts
Offered: Fall-Spring
Prerequisite: CHE 114

CHE 121 Essentials of Organic Chemistry Laboratory: Study of practical organic laboratory techniques and preparations to illustrate the lectures in CHE 120. (C:1.5; H:3).
Requirement Designation Regular Liberal Arts
Offered: Fall-Spring
Prerequisite: CHE 120.

CHE 244 Introduction to Biochemistry: (Closed to students majoring in Chemistry.) Introductory course emphasizing the study of the structure, reactions, and syntheses of biological compounds; mechanism of enzyme-catalyzed reactions and biochemical genetics. (C:3; H:3).
Requirement Designation Regular Liberal Arts
Offered: Fall-Spring
Prerequisite: CHE 120.
Notes: No student may receive credit for both CHE 244 and CHE 444 or CHE 446.

CHE 245 Biochemistry Laboratory: (Closed to students majoring in Chemistry.) Laboratory exercises designed to illustrate the biochemical aspects of nutrition. Properties and metabolic roles of carbohydrates, lipids, proteins, enzymes, hormones, vitamins, and minerals will be emphasized. (C:1.5; H:3).
Requirement Designation Regular Liberal Arts
Offered:Fall-Spring
Prerequisite: CHE 120 and CHE 121;Corequisite: CHE 244.
Notes: Credit may not be received for both CHE 245 and CHE 447.

Courses required as part of the chemistry majors but run outside of the department

Courses in Biology

BIO 166 Principles of Biology: Cells and Genes: Introduction to the principles of biology governing the unity and diversity of living organisms, with special emphasis on molecular, subcellular and cellular levels of organization in plants and animals, and on genetics and evolution. Laboratory exercises consist of experimental procedures illustrating basic concepts of biology. (C:4; H:6).
Requirement Designation Required Core - Life and Physical Sciences
Offered: Fall-Spring
Notes:This course satisfies either Life & Physical Science or Scientific World requirement in the CUNY 2013 Gen Ed requirements at Lehman.

BIO167 Principles of Biology: Organisms: Introduction to the principles of biology governing the unity and diversity of living organisms, with special emphasis on biological diversity, physiological mechanisms involved in the coordination of activity in plants and animals, and ecology. Laboratory exercises consist of experimental procedures illustrating basic concepts of biology. (C:4; H:6).
Requirement Designation Required Core - Life and Physical Sciences
Offered: Fall-Spring
Notes: This course satisfies either Life & Physical Science or Scientific World requirement in the CUNY 2013 Gen Ed requirements at Lehman.

Courses in Mathematics

MAT 175 Calculus I: Differentiation of functions of one variable; applications to motion problems, maximum-minimum problems, curve sketching, and mean-value theorems. (C:4; H:4).
Requirement Designation Required Core – Mathematical & Quantitative Reasoning
Offered: Fall-Spring
Prerequisite: A grade of C (or better) in MAT 172 or a grade of C (or better) in both MAT 103 and MAT 171 or placement by the Department of Mathematics; Corequisite: MAT 155.
Notes: (1) Students may not receive credit for both MAT 174 and MAT 175. (2) MAT 174 will not serve as a prerequisite for MAT 176.

MAT 176 Calculus II: Riemann sums, logarithmic and exponential functions, integration of functions, applications of the definite integral, including area, volume, and arc length, infinite series and power series in one variable. (C:4; H:4).
Requirement Designation Required Core – Mathematical & Quantitative Reasoning
Offered: Fall-Spring
Prerequisite: A grade of C or better in MAT 175; Corequisite: MAT 156.

MAT 226 Vector Calculus: Vectors in two and three dimensions, equations of lines and planes, functions of several variables, partial differentiation, directional derivatives, gradients, optimization with Lagrange multipliers, multiple integration, line integrals, and vector fields. (C:4; H:4).
Requirement Designation Regular Liberal Arts
Offered: Fall-Spring
Prerequisite:A grade of C or better in MAT 176.

Courses in Physics

PHY 166 General Physics I: (Algebra-based Physics: Customarily taken by premedical, preveterinary, and predental students.) Mechanics, heat, and sound. (C:5; H:6 (4, lecture; 2, lab)).
Requirement Designation Required Core - Life and Physical Sciences
Offered: Fall-Spring
Prerequisite: MAT 172, or MAT 171 and MAT 103, or satisfaction of requirements for placement into calculus I (MAT 175).
Notes: (1) Only one of the following courses may be taken for credit: PHY 166 or PHY 168. (2) This course satisfies either Life & Physical Science or Scientific World requirement in the CUNY 2013 Gen Ed requirements at Lehman.

PHY 167 General Physics II: (Algebra-based Physics: Customarily taken by premedical, preveterinary, and predental students.) Electromagnetism, geometrical and physical optics, and introduction to modern physics. (C:5; H:6 (4, lecture; 2, lab))
Requirement Designation Required Core - Life and Physical Sciences
Offered: Fall-Spring
Prerequisite: Either PHY 135 or PHY 166 or PHY 168 and Departmental permission.
Notes: (1) Only one of the following courses may be taken for credit: PHY 167 and PHY 169. (2) This course satisfies either Life & Physical Science or Scientific World requirement in the CUNY 2013 Gen Ed requirements at Lehman.

PHY 168 Physics I for Scientists and Engineers: (Calculus-based Physics: Designed for those preparing for careers in the physical sciences and engineering.) Motion, Newton's laws, work and energy, mechanics of rigid bodies, elasticity, mechanics of fluids, temperature, heat, kinetic theory of matter, wave motion, and sound. (C:5; H:6 (4, lecture; 2, lab))
Requirement Designation Regular Liberal Arts
Offered: Fall-Spring
Prerequisite: PREREQ or COREQ: MAT 176.
Notes: This course satisfies either Life & Physical Science or Scientific World requirement in the CUNY 2013 Gen Ed requirements at Lehman.

PHY169 Physics II for Scientists and Engineers: Calculus-based Physics: Designed for those preparing for careers in the physical sciences and engineering.) Electrostatics, electrodynamics, geometrical and physical optics. (C:5; H:6 (4, lecture; 2, lab))
Requirement Designation Regular Liberal Arts
Offered: Fall-Spring
Prerequisite: PHY 168. PREREQ or COREQ: MAT 226.
Notes: This course satisfies either Life & Physical Science or Scientific World requirement in the CUNY 2013 Gen Ed requirements at Lehman.

Program Goals and Specific Learning Objectives

The Lehman College Chemistry department believes in a standard set of chemistry skills that all chemistry majors will acquire as they progress through their required chemistry major courses. These skills are called learning objectives and are tied to our main Program Goals. The Program Goals provide the overview of the Department's mission, while the Specific Learning Objectives are the skills required to realize these outcomes.

Chemistry Program Goals:

- To encourage the development of a broad foundation in Chemistry. One that stresses fundamental chemical principles built through a combination of scientific reasoning and problem solving, and how these principles apply to everyday life.
- To provide students with the skills that they need to succeed in graduate programs, professional school or chemistry related careers.
- To expose students to a wide range of experimental techniques and analytical instrumentation.

Specific Learning Objectives:

Upon completion of a bachelor's degree in chemistry, Lehman College graduates will be able to:

1. Recognize the nature of matter and its transformation from one form into another.
2. Represent chemical substances using formulas, chemical reactions using chemical equations and consider possible reaction mechanisms.
3. Use the principles of thermodynamics to explain the behavior of chemical systems.
4. Integrate mathematics and physics knowledge in solving complex chemical problems using equations that may contain unknown variables.
5. Recognize the underlying chemical principles of life and apply these to biological systems.
6. Collect measurable chemical data in a laboratory setting.
7. Assess the accuracy and precision of measurements using mathematical and statistical analysis.
8. Represent, analyze and interpret complex and integrated chemical data.
9. Effectively convey chemical knowledge in both written and oral form.
10. Collaborate effectively as part of a group to solve chemical problems, engage in conversations about chemistry and value other people's opinions.
11. Be aware of the ethical principles and professional conduct associated with chemical research and professional positions.

The following descriptions are what we have been using to EVALUATE the courses and programs: These are different to what is on the website: I think that we should talk about what to put in the report….

LEARNING GOALS AND OBJECTIVES

Upon completion of a bachelor's degree in Chemistry graduates will be able to:

Goal I - Understand the nature of Matter and its transformation from one form into another.

Learning Objectives:
To achieve this goal, students should be able to:

A. Represent substances by writing various types of formulas (empirical, molecular, and structural).
B. Use 3D models effectively.
C. Represent and explain chemical reactions by using chemical equations.
D. Solve problems using measured data and theoretical concepts.
E. Assess the precision of measurements using mathematical and statistical analysis.
F. Illustrate the electronic structure of atoms, elements and compounds.
G. Use the electronic structure to explain the properties of atoms, elements and compounds.
H. Obtain rate laws for chemical reactions from experimental data.
I. Propose reaction mechanisms consistent with rate laws.
J. Explain the effect of stresses on chemical equilibria.
K. Explain the principles of thermodynamics and its relationship to equilibrium using enthalpy, entropy and Gibbs free energy.

Goal II - Master basic chemical laboratory skills.

Learning Objectives
To achieve this goal, students should be able to:

A. Prepare chemical substances.
B. Separate and purify substances.
C. Make precise and accurate measurements using physical and chemical equipment and instruments.
D. Characterize substances using both classical and instrumental methods.

Our degree programs are assessed by completion of each course in the recommended programs. The courses are naturally tiered from 1-4, from introductory level through to advanced. A breakdown of all courses offered within the chemistry department is the table on the next page.

All course offerings

Course	Course (Name)	Learning Outcomes														
		I A	**I B**	**I C**	**I D**	**I E**	**I F**	**I G**	**I H**	**I I**	**I J**	**I K**	**II A**	**II B**	**II C**	**II D**
CHE 166	General Chemistry I	T1	T1	T1	T1	T1	T1	T1								
CHE 167	General Chemistry I Laboratory	T1		T1	T1	T1							T1	T1	T1	
CHE 168	General Chemistry II				T1	T1	T1	T1	T1	T1	T1	T1				
CHE 169	General Chemistry II Laboratory	T1		T1	T1	T1			T1	T1	T1	T1	T1	T1	T1	
CHE 232	Organic Chemistry I	T2	T2	T2	T2		T2	T2		T2	T2	T1				
CHE 233	Organic Chemistry I Laboratory	T2	T2	T2	T2					T2			T2	T2		T1
CHE 234	Organic Chemistry II	T2	T2	T2	T2		T2	T2		T2	T2					
CHE 235	Organic Chemistry II Laboratory	T2	T2	T2	T2								T2	T2		T2
CHE 249	Quantitative Analysis	T2		T2	T2	T2					T2	T2	T3	T3	T2	T2
CHE 342	Physical Chemistry I			T3	T3	T3	T3	T3								
CHE 345	Physical Chemistry I Laboratory			T3	T3	T3									T3	T3
CHE 344	Physical Chemistry II			T3	T3	T3	T3	T3	T2	T3	T3	T3				
CHE 347	Physical Chemistry II Laboratory			T3	T3	T3			T2	T3	T3	T3			T3	T3
CHE 391	Chemical Investigations	T2	T2	T2	T2	T2	T3	T3	T2	T2	T2	T2	T3	T3	T3	T3
CHE 442	Inorganic Chemistry	T4	T4	T4	T4		T4	T4		T4	T3	T3				
CHE 443	Inorganic Chemistry Laboratory	T4	T4	T4	T4	T3							T4	T4	T3	T4
CHE 444	Biochemistry I	T3	T3	T3	T3	T3					T3	T3				
CHE 446	Biochemistry II	T3	T3	T3	T4	T3				T4	T3	T3				
CHE 447	Biochemistry Laboratory												T3	T3	T2	T2
CHE 449	Instrumental Analysis			T3	T4	T4					T3		T3	T4	T4	T4
CHE 450	Seminar															
CHE 491	Chemical Research	T4		T4	T4	T4	T4	T4	T3	T3	T3	T3	T4	T4	T4	T4

Laboratory part of the course

Optional as part of the degree

Chapter 3
Students

Background

Lehman College is a primarily undergraduate institution heavily serving the local community. Nearly 80% of our students come from the five boroughs of New York City and another 10% come from Westchester County just north of the Bronx.

Table 3.1. *Students registered at Lehman College- Fall 2018*

Type	Full-Time/Part-Time	Count
Undergrad	Full-Time	7,794
	Part-Time	4,845
Undergrad Total		**12,639**
Grad	Full-Time	214
	Part-Time	1,934
Grad Total		**2,148**
Total		**14,787**

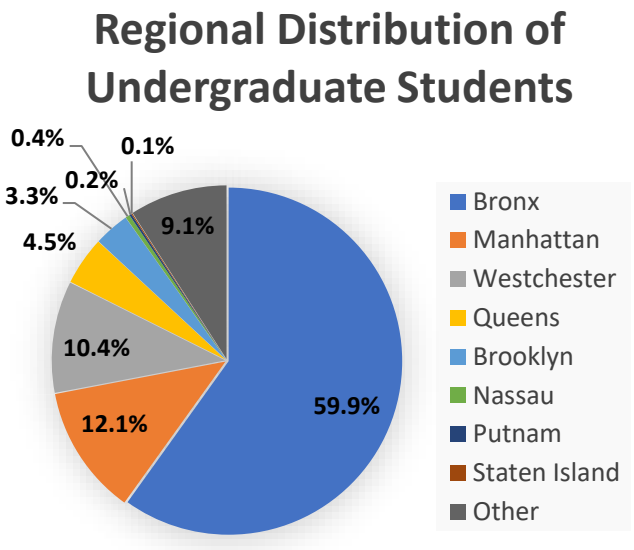

Figure 3.1*. Regional distribution of undergraduate students registered at Lehman in Fall 2018*

***Table 3.2**. Origin of all students registered at Lehman College in Fall 2018*

County	Percentage	
	Grad	**Undergrad**
Bronx	44.9	59.9
Brooklyn	5.4	3.3
Manhattan	10.9	12.1
Nassau	2.7	0.4
Putnam	0.8	0.2
Queens	9	4.5
Westchester	17.8	10.4
Other	8.2	9.1
Staten Island	0.3	0.1

Lehman has a significant transfer population, mostly from other CUNY schools. **Table 3.3** shows the breakdown of students based on their admission status for the Fall 2018 semester for the entire college. At the undergraduate level, only about 8% of the total population are freshmen students while nearly 18% are transfer students. This means a majority of our student body has completed general education and introductory coursework at other institutions.

***Table 3.3.** Admission status of students registered at Lehman College in Fall 2018*

Type	Admission Code	Count
Undergrad	Continuing	7,886
	Freshman	1,032
	New Transfers	2,232
	Readmitted	688
	Students with Permits from Other CUNY Colleges	-
	Non-DGR to DGR	-
	Missing Data	4
	College Now	797
UGRD Total		**12,639**
Grad	Continuing	1,354
	Freshman	724
	Readmitted	54
	Non-DGR to DGR	16
	Students with Permits from Other CUNY Colleges	-
Grad Total		**2,148**
Total		**14,787**

The 4 year and 6 year graduation rates for fulltime first-time freshmen was 54% and 60% in 2011. The 4 year and 6 year graduation rates for transfer students was 23% and 43%. **Table 3.4** below shows the number of students graduating in any one year as a percentage of the total student body.

Table 3.4. *Numbers of students graduating as a percentage of total student numbers*

Year	Number of Graduates	Percentage of Total Student Numbers
2012-13	1783	13.8%
2013-14	1915	14.3%
2014-15	2023	14.3%
2015-16	2132	14.3%
2016-17	2138	13.7%
2017-18	2458	14.9%

Chemistry Students and Enrollment

The Chemistry department has seen tremendous growth over the past 8 years, with the number of majors growing over 300% from 35 in Fall 2012 to 113 in the Fall 2018. At the same time growth in classes provided by the department have grown approximately 100% from 1023 in Fall 2012 to 2001 in Fall 2018. The department's conclusion is that efforts to reform the major and make introductory chemistry have helped create these increases. Examination of students graduating from the department in 2017/2018 revealed 14 graduated with a BS and 15 graduated with a BA (Table 3.6).

Table 3.5. *Breakdown of Chemistry enrollment, majors and minors*

Semester	Enrollment	Majors	Minors	FTEs
Fall 2012	1023	35	3	167.53
Spring 2013	1325	32	3	213.63
Summer 2013	642	10	2	52.18
Fall 2013	1142	40	4	184.67
Spring 2014	1379	48	5	220.33
Summer 2014	597	16	1	48.13
Fall 2014	1448	54	4	233.7
Spring 2015	1694	65	5	271.33
Summer 2015	690	27	1	56.37
Fall 2015	1830	62	5	297.03
Spring 2016	1967	81	4	320.5
Summer 2016	649	35	2	54.2
Fall 2016	2065	92	6	338.47
Spring 2017	1826	97	10	313.73
Summer 2017	476	35	6	42.1
Fall 2017	2031	104	15	345.87
Spring 2018	2018	105	12	341.47
Summer 2018	346	28	1	33.72
Fall 2018	2001	113	6	359.33

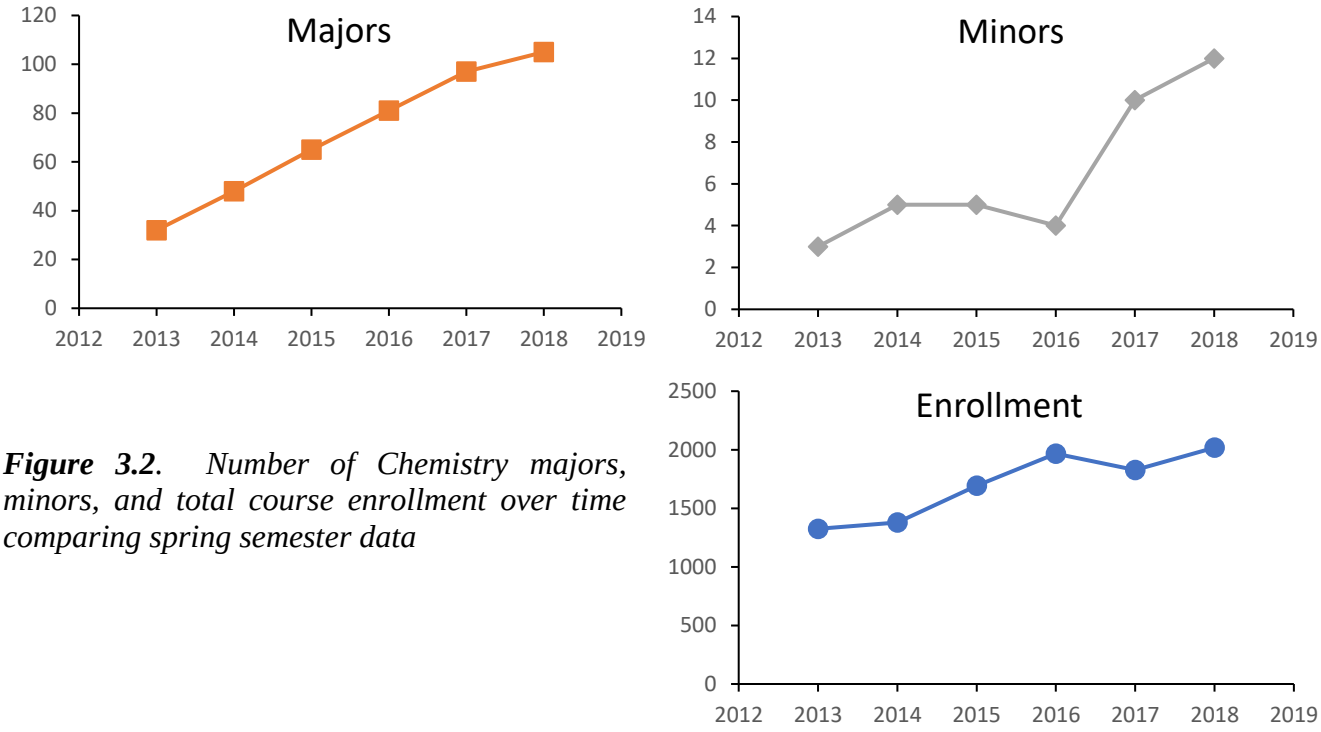

Figure 3.2. *Number of Chemistry majors, minors, and total course enrollment over time comparing spring semester data*

Table 3.6. *List of students who graduated with a major in Chemistry in 2017/2018*

Year	First Name	Last Name	Major & Degree
2018	AHMED-BADAWI	SIIBA	Chemistry BS
2018	ALISA	GURDYAL	Chemistry BA
2017	ANN	PALATHINGAL	Chemistry BA
2017	BRANDON	VASQUEZ	Chemistry BS
2017	CHANEL	PAULINO JEREZ	Chemistry BA
2018	CHARLIE	FERNANDEZ	Chemistry BA
2018	DIANA	ORDONEZ PEREZ	Chemistry BS
2018	FLORENT	MVOGO	Chemistry BS
2018	GENESIS	CELI	Chemistry BA
2018	JOHN	BRADSHAW	Chemistry BS
2018	JOSHUA	MOLINA	Chemistry BA
2017	KAMALA MEENA	SRINIVASAN-SUTTON	Chemistry BS
2017	KENNETH	APPIAH	Chemistry BA
2017	KWEKU	AMOO	Chemistry BS
2018	LEVI-YAACKOV	RYBALOV	Chemistry BA
2018	LISA	SONG	Chemistry BS
2018	MADELINE	WONG	Chemistry BS
2018	MITASHA	PALHA	Chemistry BS

2018	NATALIE	BIALOSTOZKY	Chemistry BA
2018	NOSAKHARE	UWOGHIREN	Chemistry BA
2017	OLUWAFUNKE	ADEYEMI	Chemistry BS
2018	ORDY	GNEWOU TAKOUKAM	Chemistry BA
2018	OSITA	ENWERONYE	Chemistry BA
2018	RAMSEY	SALCEDO	Chemistry BA
2018	SANA	BATOOL	Chemistry BS
2018	SHANELL	GEORGE	Chemistry BS
2018	SYLVESTER	TAMAKLOE	Chemistry BS
2018	TAMANNA	AKTER	Chemistry BA
2018	TCHAA	TARO	Chemistry BS
2017	WILLIAM	CENTENO	Chemistry BA

Who are our students?

In order to assess how the Chemistry department and the majors that it offers are viewed by students a survey of seniors in the Fall 2019 semester was performed. The survey had a response rate of approximately 24% with 21 out 89 students responding. Respondents were asked '*How satisfied are you with your experience with the Chemistry Department?*'. Most respondents were satisfied with 24% extremely satisfied, 38% very satisfied and 24% somewhat satisfied. A total of 14% responded as not so satisfied and not at all satisfied. Students were asked '*how much do your teachers care about you?*' to gain understanding of their perception of faculty. A majority of 86% had a positive perception of faculty. Students were asked '*How relevant do you think what you're learning at school is to what you want to do in the future?*' to gain insight about their perception of the course material. A majority of 76% found the course material was either extremely or very relevant.

A closer look at respondents showed that 67% had engaged in research activities, with 43% percent of those research activities with Lehman College Chemistry Department faculty. The majority of respondents 45% intend to earn a medical related advanced degree (eg. MD, DDS, PharmD) after graduation and 35% aim to obtain a chemistry related advanced degree (eg. MS, PhD). Only 10% intend to seek a chemistry related job directly after graduation and 5% intend to seek a non-chemistry related position. Students were asked, if willing to provide a short bio of themselves to better understand who our students were. These bios are included below:

- *My name is Ghadeer Alwail. I am from Yemen. I chose chemistry because I love scientific subjects and I want to go to medical school.*

- *My name is Mary Galicia and I'm from Yonkers, NY. I've decided to pursue chemistry as a career because of my passion for it. Currently, my research experience consists of working in Prof. Burton-Pye's lab.*

- *I'm Weldy, I'm Dominican. I'm a third-year student and I chose chemistry because it's what I'm most passionate about in life. Coming into the lab to help advance a project fills me with joy*

- *I am a first generation American of Dominican decent. I am 30 years old and came back to school at 26 years with the intention to work in the HIV research field. I look forward to helping both positive people and negative people at risk.*

- *Graduated from Stony Brook University with a BS in Psychology, pursuing a BA in Biochem at Lehman to raise my GPA and better prepare myself to apply for med school.*

- *My name is Luis M Vargas, I was born in the Dominican Republic. I decide to study Chemistry because I'm a curious person always wanting to know more. For me Chemistry is the study of everything and can provide me with answers from different perspective.*

- *My name is Vladyslav Bodnar and I'm majoring in Chemistry. I research polyoxometalates under the supervision of Dr. Burton-Pye. My research interests include inorganic chemistry and radiochemistry. Over the summer of 2018 and 2019 interned at Brookhaven National Laboratory, where performed research on the field of radiochemistry under the supervision of Dr. Deri and Dr. Cutler.*

- *My name is James Mercado. I was born in the Bronx and grew up in the Dominican Republic. I live in the Highbridge area of the South Bronx. I chose chemistry because I loved the perspective despite almost failing the AP Chemistry course in High School. My high school teacher had a great impact on me choosing chemistry. My early life interests ultimately reflected my choice to major in chemistry because they matched the discipline.*

To provide us with a picture of how students interacted with the department, students were asked an open-ended question to tell us about a positive experience they've had with the chemistry department. Below those responses are provided:

- *If it weren't for Prof. Donna McGregor, I most likely would not be a chemistry major. She has been an amazing teacher and mentor. When I was struggling in her class, she didn't give up on me despite my faults as a student and pushed me to improve myself. I strongly believe that Prof. Donna is the reason I've discovered my passion for chemistry. Prof. Ben Burton-Pye is also someone that's made an impact on me at Lehman. He is another excellent instructor and a wonderful research mentor. He's very supportive and makes learning - both in class and in the lab - fun and engaging.*

- *I do research with one of the professors in the chemistry department and it is such a pleasure coming in to work on this project. I have made many friends from this lab and project.*

- *A lot of support, not just from professors but TA and students as well.*

- *I'm actually a new transfer coming in with a lot of credits so my only class right now is my biochemistry I course and the professor is great. I want to get more involved with research options next semester.*

- *During my lab visits for my chemistry seminar class I had to chance to witness some research areas undertaken by fellow students and how it will go a long way to aid in their academic achievements. I therefore want to do research but don't know how to commence the process*

- *I met with Dr. Burton-Pye over the summer prior to enrolling at Lehman, and he was very helpful in giving me permission to enroll in courses and figuring out what my options were.*

- *Professor O'Connor listened and allowed us to interact with him through lab. He provided insight that was beyond the lab on career development.*

- *I struggled a lot in orgo2 but out T.A Aanchel was amazing. She always made herself available so we could understand the material and pass the course. This also goes for a lot of chem professors here. They are engaged with the students and make an effort to give an additional helping hand if need be.*

- *I enjoy the fact that the faculty members of the chemistry department are approachable and are always willing to answer questions. I also enjoy working in a research laboratory where I get a lot of research freedom. This allows me to gain experience of independent research that is very crucial at the graduate level research.*

- *I have been an undergraduate research assistant since 2017 and I enjoy contributing to investigations and working closely with a mentor. Also, professors in the department care about their students.*

Student Achievement and Awards

The Chemistry Department hosts an annual Sweeny Lecture where departmental awards are given to students every year. **Table 3.7** details the student awards for the past four years.

Table 3.7. *Chemistry departmental awards for graduating the seniors 2016-2019.*

Award	2016	2017	2018	2019
Sweeny Achievement Award	Binh Nguyen and George Maio	Gabriela Rodriguez	Madeline Wong and Ordy Gnewou Takoukam	Edruce Edouarzin
John Paul Clay Achievement Award	-	Joseph A. Cruz New award started in 2017	Natalie Bialostozky	Chinelle Hutchinson
The Chemistry Student Citizen Award	Binh Nguyen	Grant Akalonu	William Centeno	Wildy Joseph

Our chemistry students have also won awards outside the department, both within the larger CUNY system and nationally. Example of such awards for the past two years are listed below.

2019

- Sana Batool — 2019 Paul & Daisy Soros Fellowship for New Americans
- Edruce Edouarzin — 2019 ACS Division of Inorganic Chemistry Undergraduate Award in Inorganic Chemistry
- Edruce Edouarzin — Lehman Students' Excellence Award in the category "Outstanding Undergraduate Research."
- James Mercado — 2018-2019 Con Edison STEM Scholarship
- Beauty Ayomide Kolade — Belle Zeller Trust Fund Scholarship
- Beauty Ayomide Kolade — Alan Margolis Scholarship

2018

- Madeline Wong: — 2018 ACS Division of Inorganic Chemistry Undergraduate Award in Inorganic Chemistry
- Hilliary Frank: — 2016-2018 Jeannette K. Watson Fellow, Watson Foundation, New York, NY

Additionally, some of our students have been invited into national and international honor societies including:

- *Sigma Xi*, The Scientific Research Society, is the international honor society of science and engineering.
- *Phi Beta Kappa*, the oldest academic honor society in the United States.

Undergraduate Research in Chemistry

The Chemistry Department faculty is passionate about education and their students, including involving undergraduate students in their research efforts. Research exposes students to the latest breakthroughs in many aspects of chemistry from engineering to medicine, from atoms to macromolecules. Many students are able to receive funding for their research activities as well as course credit and further their experiences through external Research Experiences for Undergraduates (REUs) at various prestigious programs and institutions.

The following faculty are actively mentoring and/or recruiting undergraduate researchers on the described projects:

Benjamin Burton-Pye

- f-element chemistry (lanthanides & actinides)
- Metal oxide nanostructures
- Radiochemistry
- Luminescence Imaging
- 8 current undergraduate students, 25 total since hired
- 1 current graduate student, 1 student earned PhD in 2019

Columba de la Parra

- Metabolism and Breast Cancer
- mRNA Translational control and cancer
- Molecular mechanisms by which bioactive compounds in plants and food act on chronic diseases

Melissa Deri

- Radiopharmaceutical design
- Radiometal chemistry
- Chelator development
- Chemical education research
- 4 current undergraduate students, 5 total since hired
- 2 current graduate students

Andrei Jitianu

- Inorganic and hybrid sol-gel materials
- Mechanism of hybrid gel formation
- Oxide mono-disperse particles: drug delivery and cancer targeting
- Optical properties of oxide thin films
- 2 current undergraduate students, 8 total over the past 5 years
- 1 current graduate student

Tom Kurtzman

- Development of computational tools
- Rational drug discovery
- Solvation thermodynamics
- G-protein coupled receptors
- 1 undergraduates total over the past 5 years
- 7 current graduates students, 1 student earned PhD in 2018

Gustavo Lopez

- Development and application of computational techniques
- Condensed phase systems
- Biomolecular systems

Prabodhika Mallikaratchy

- Generation of new oligonucleotide aptamers against cellular targets
- Development of aptamer-based synthetic antibodies

Donna McGregor

- Chemical education pedagogy
- Technology in education and the flipped classroom
- Amino acids as building blocks to study metal binding
- 5 current undergraduate students
- 2 current graduates students

Naphtali O'Connor

- Organic biomedical chemistry
- Biodegradable hydrogels
- Developing compounds that inhibit metal-induced amyloidosis

Funding for undergraduate research in chemistry has been awarded through:

- Louis Stokes Alliance for Minority Participation in Research Program (LSAMP)
- Pathways to Student STEM Success (PTS^3)
- Lehman College Intensive Research Opportunity (LIRO)
- CUNY Summer Undergraduate Research Program (C-SURP)
- The National Science Foundation (NSF)
- National Institute of Health – Lehman on the Rise program
- CUNY Service Corps

Chapter 4

Facilities and Resources

The Department of Chemistry is currently housed in Davis Hall (DH) and New Science Building (NSB). Within Davis Hall the department occupies most of the 3rd floor, and has additional space on the 4th, 1st floors and in the basement.

The Department of Chemistry currently has 7 designated teaching laboratories:

- DH 026 - Biochemistry, Quantitative Analysis and Physical Chemistry
- DH 307 - Organic Chemistry
- DH 311 - Organic Chemistry
- DH 317 – Inorganic Chemistry, Instrumental Analysis
- DH 331 – General Chemistry
- NSB 3103 – General Chemistry
- NSB 3107 – General Chemistry

These courses are served by 3 preparation areas and 4 chemical and equipment storage rooms. On the 3rd floor of DH, the department accesses 2 lecture halls and 1 classroom room, the largest holding approximately one hundred students. The larger general chemistry courses are held in the Gillet Hall 024 lecture hall which seats up to 200 students. All classrooms and lecture halls are equipped with audiovisual equipment that enable presentations by computers. There also is an computer facility in DH 325 that can be used for computer-based teaching and learning. This facility contains twenty computers with a variety of chemistry and word processing software including Microsoft Office, Bruker Topspin and ChemBioOffice 2016. Students also have access to a Study Room in DH 320.

In addition to teaching and storage spaces, the DH 3rd floor also hosts the department's main office and a number of staff offices and research laboratories. Additional research laboratories are on the 4th and 1st floor of DH. The basement houses the NMR, X-ray diffractometer, GC-MS and FTIR in the equipment room in DH 024. In addition, research space for 2 chemistry faculty are present in NSB. The floor plans for these areas are presented below:

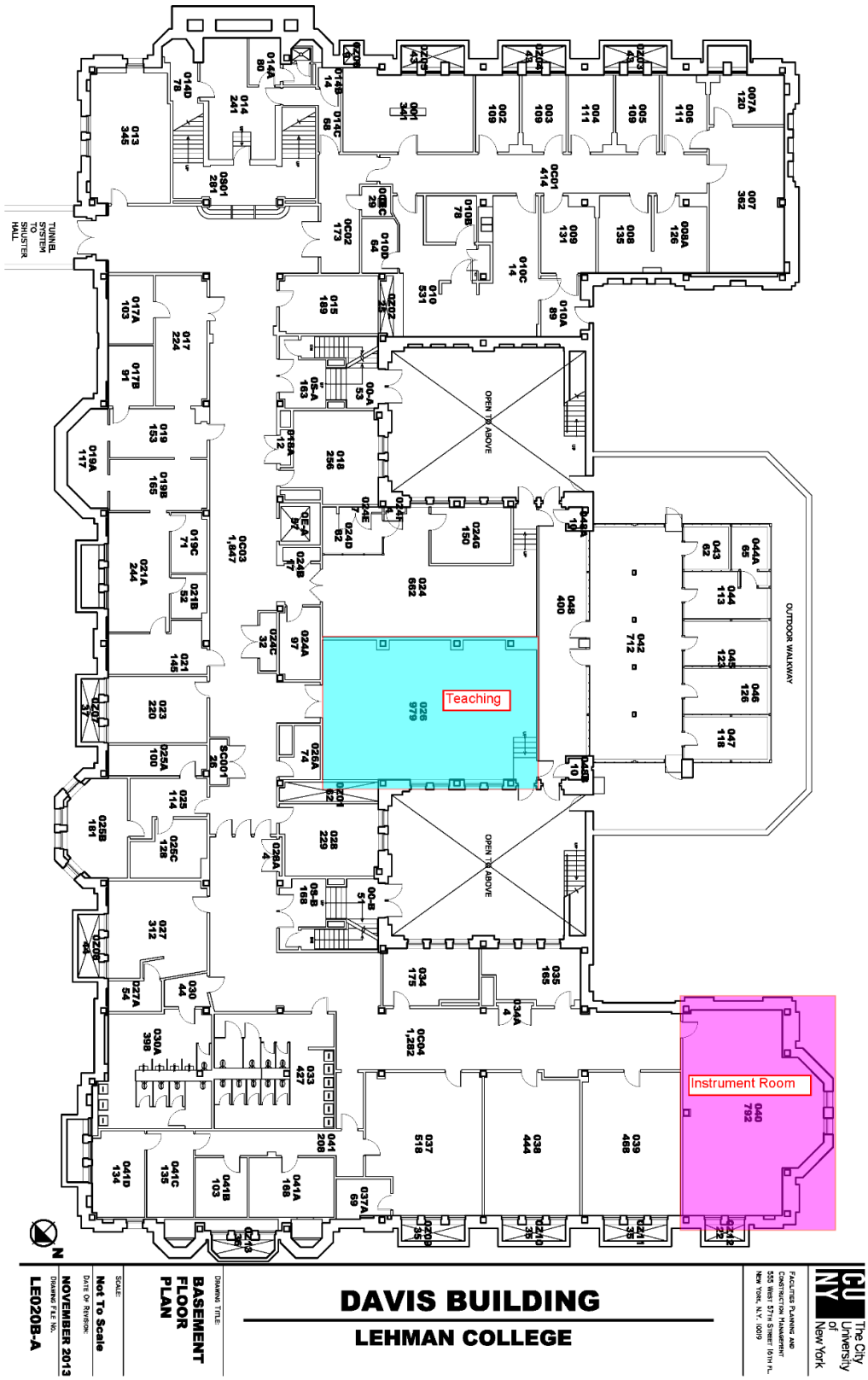

Figure 4.1. Floor plans for Davis Hall, Basement.

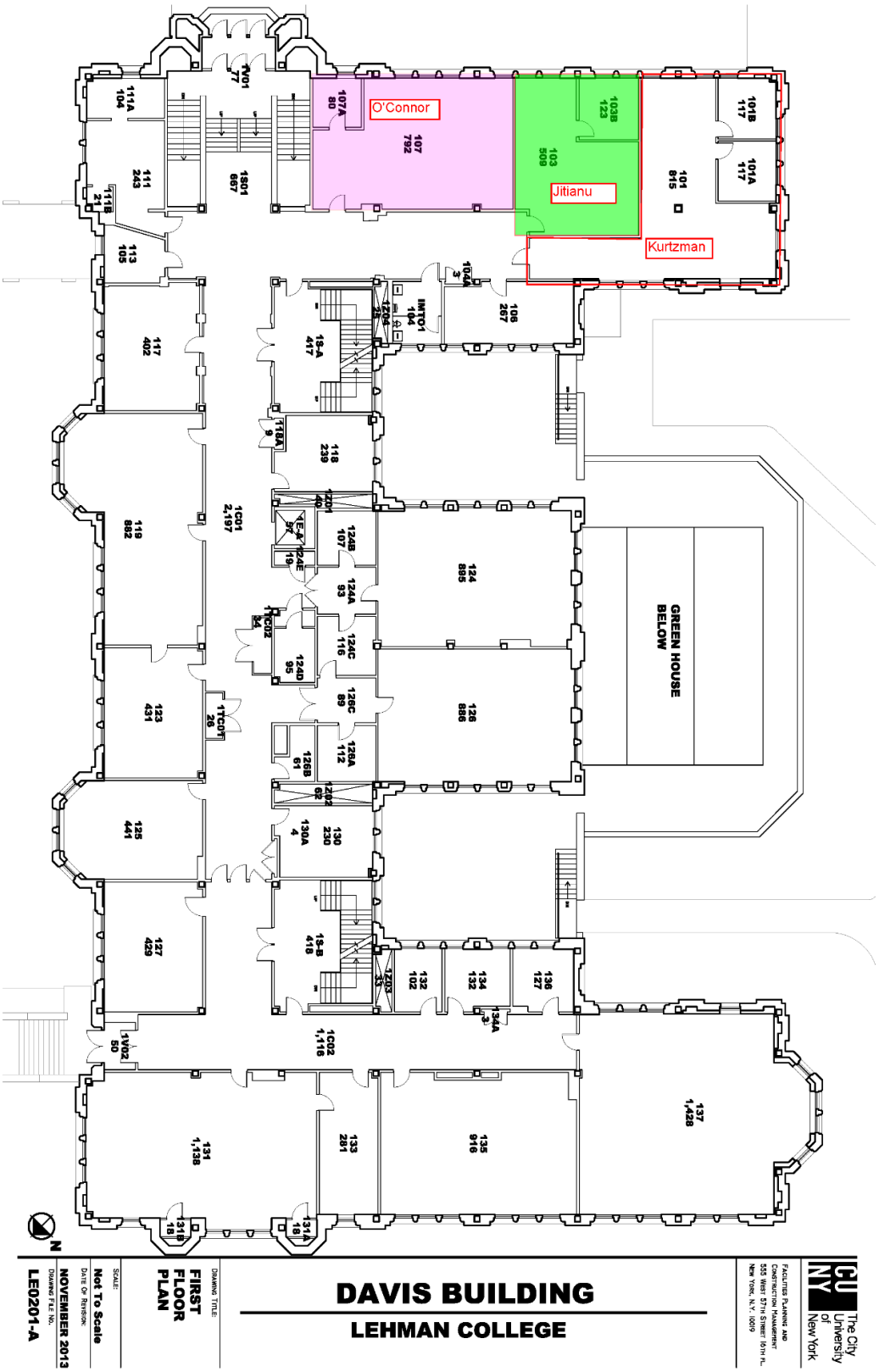

Figure 4.2. Floor plans for Davis Hall, 1st floor.

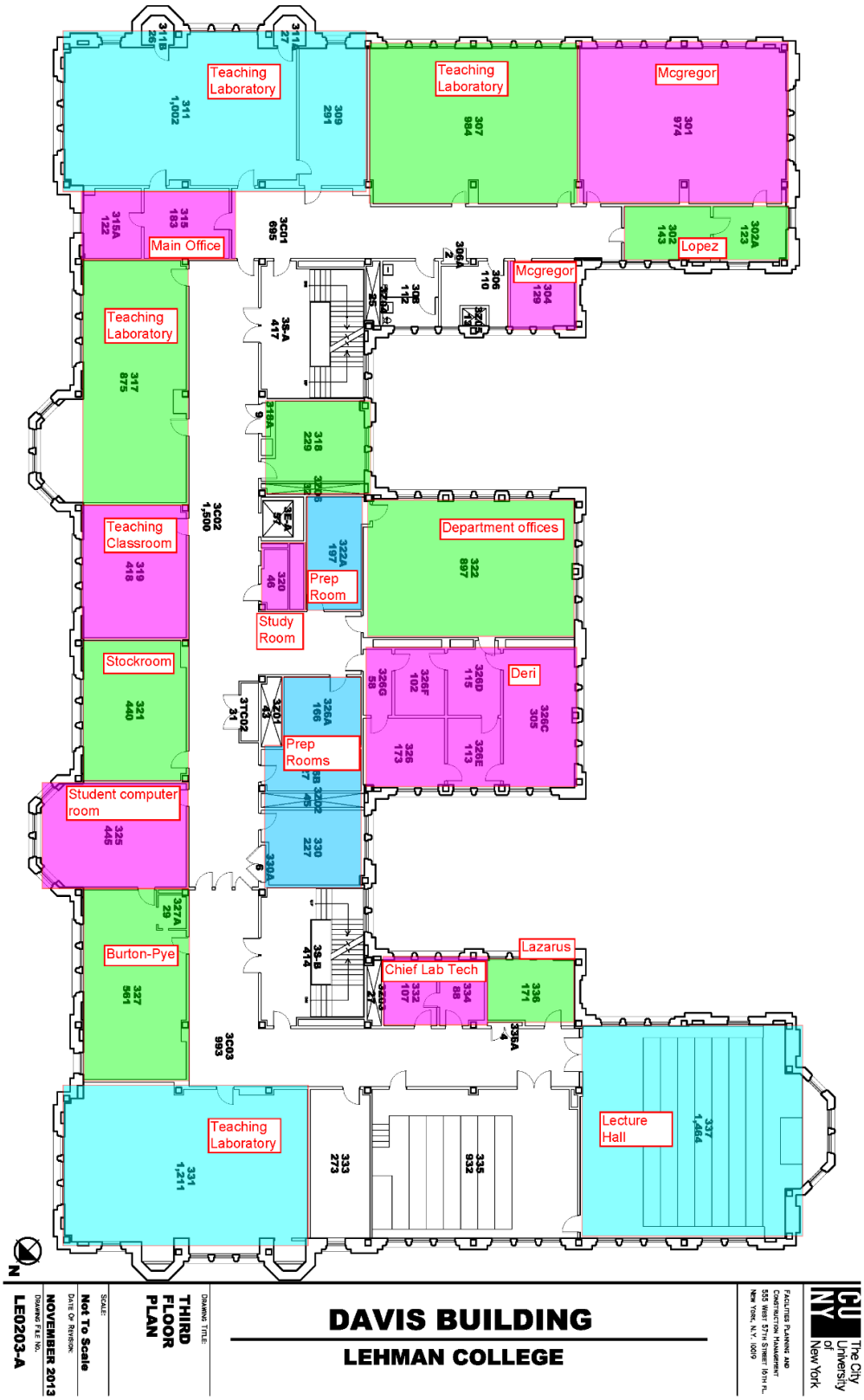

Figure 4.3. Floor plans for Davis Hall, 3rd floor.

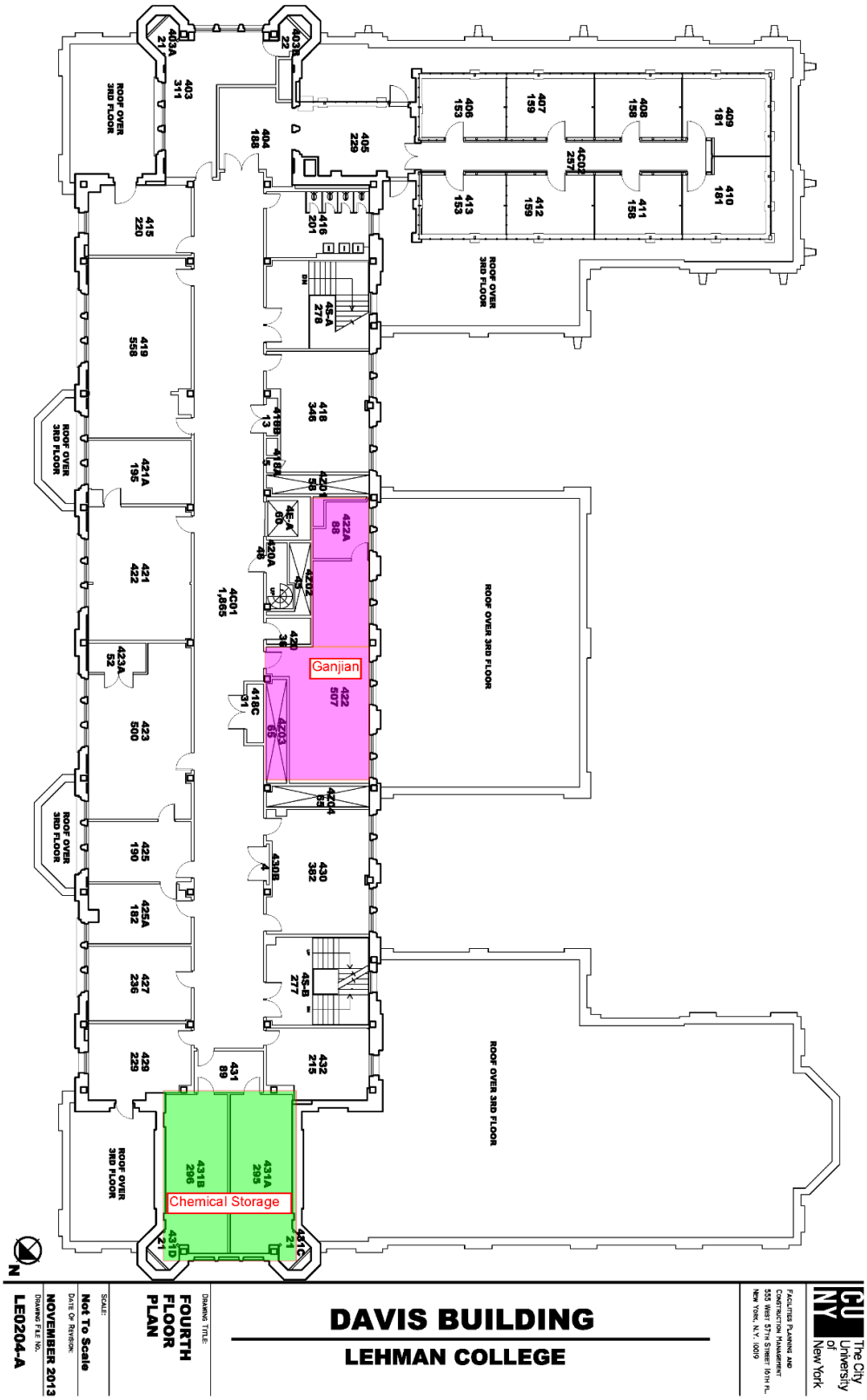

Figure 4.4. Floor plan for Davis Hall, 4th floor.

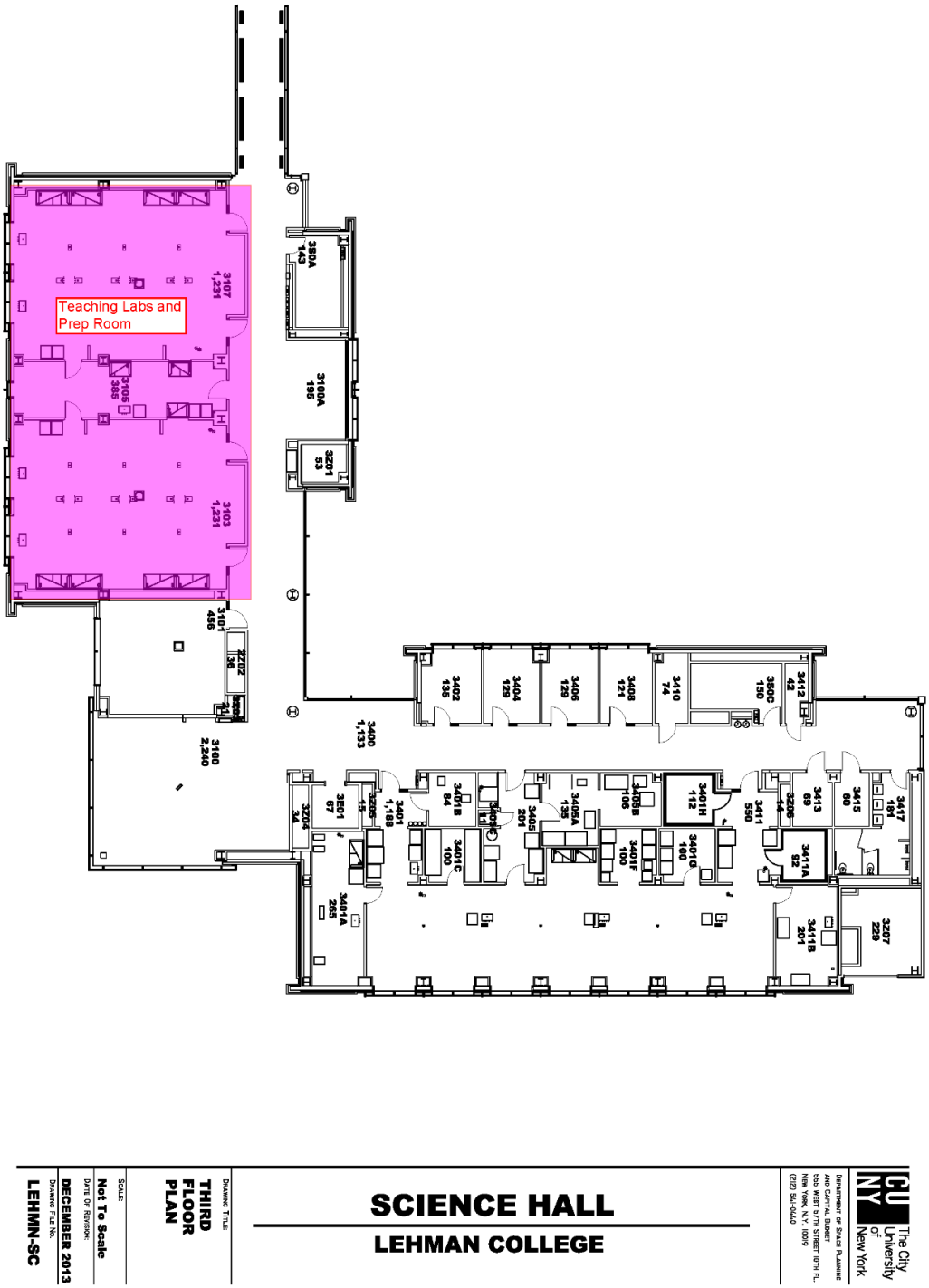

Figure 4.5. Floor plan for New Science Building, 3rd floor.

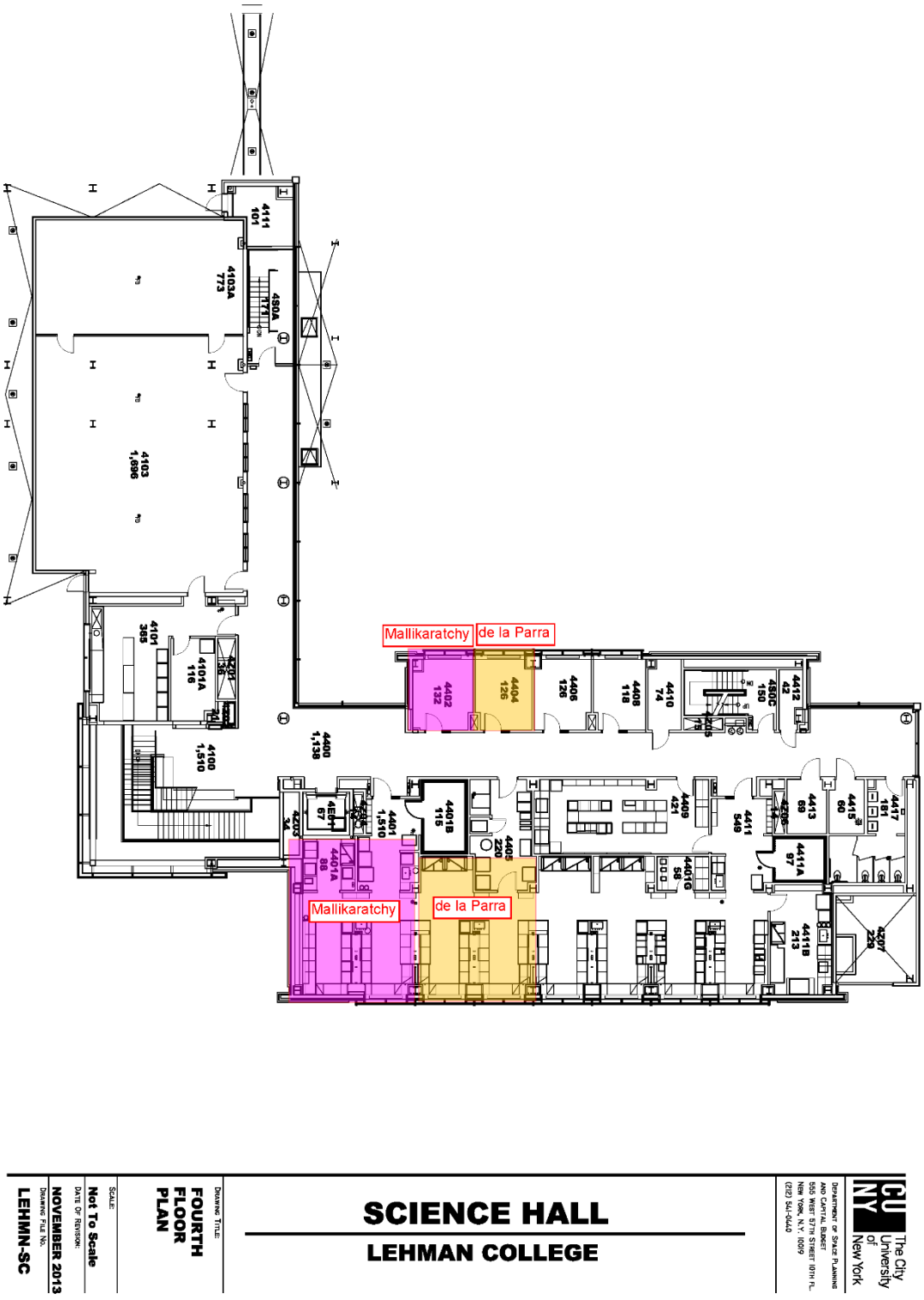

Figure 4.6. Floor plan for New Science Building, 4th floor.

Equipment in the department is divided between teaching and research purposes. Equipment for teaching purposes are maintained by a staff of laboratory technicians. In terms of major equipment for teaching purposes, the department is equipped with 2 Perkin Elmer UV/Vis and 2 Nicolet FTIR spectrophotometers, a PicoSpin 45 Benchtop NMR. Recently 2 Waters Alliance 2695 HPLC systems and a Perkin Elmer GC Model Autosystem XL were also donated to the department from Perrigo Inc. and are being prepared for use in our Instrumental Analysis course. The Instrumental Analysis course was restarted after many years of dormancy due to low majors. The surge in majors has created a demand and the department is preparing to provide the necessary equipment for this course. Additionally, senior courses are sometimes supplemented by equipment maintained by research faculty, such as the X-Ray diffractometer in Inorganic Chemistry and GC-MS in Instrumental Analysis.

The equipment present within the research labs of chemistry faculty reflects the diversity of the research performed within the department. Research labs are equipped to perform a variety of research including fume hoods, cell culture hoods and facilities for radioactive research. A full catalogue of major equipment that can be found in research labs within the department can be found below.

Table 4.1. Prof. Burton-Pye research lab equipment.

Lab: Burton-Pye			
Equipment	*Year Acquired*	*Manufacturer and Model*	*Service Contract (Y/N)*
Modular UV-Visible Spectrometer/fluorimeter: • Light source • Detector (UV-Vis) • Detector (NIR) • LED Light source	2018	Stellarnet inc. SL5 + Deuterium and halogen lamp Silver Nova 25 TEC 2 BW12 DS-InGaAs-512 NIR-25 BW-ND SL1-LED	 N N N N
Fluorescence spectrometer	2018	Photon Technologies Inc. Horiba Quantamaster 8000. 75 W zenon arc lamp, dual Hamamatsu R928 PMT 0149-914 Detectors.	N
Tube furnace	2016	Thermoscientific. Lindberg blue M	N
Potentiostat	2016	Princeton Applied Research VersaStat 3 with a Solartron analytical 12962A Impedence Cell	N

Table 4.2. Prof. Deri research lab equipment.

Lab: Deri Lab – DH 326 and 327			
Equipment	*Year Acquired*	*Manufacturer and Model*	*Service Contract (Y/N)*
Semiprep HPLC	2018	Shimadzu Prominence Semi-Prep Binary HPLC with LC-20AR Pumps, 5 Channel Degasser, SUS Variable Mixer, Manual Injector, PDA, Fraction Collector, and RID-10A Refractive Index Detector	N
RadioHPLC	2019	Shimadzu Prominence Analytical HPLC with UV Detector and Eckert & Ziegler Flow-Count radiodetector	N
RadioTLC Scanner	2019	Eckert & Ziegler AR-2000 1-plate TLC Imaging Scanner System	Y
Dose Calibrator and Well Counter	2019?	Capintec CRC-55TW Dose Calibrator with Well Counter	N

Table 4.3. Prof. Jitianu research lab equipment.

Lab: Jitianu			
Equipment	*Year Acquired*	*Manufacturer and Model*	*Service Contract (Y/N)*
FT-IR Nicolet	2009	IS10T-hermo Fisher	N
X-ray Diffractometer	2011	Ultima IV Theta-Theta - Rigaku	N
Theta Optical Tensiometer	2010	KSV Instruments	N
Atomic Force Microscope System	2009	Nanosurf easyScan-2 Nanosurf	N
Thermal gravimetric and Differential Thermal analyzer	2008	EXTAR TG/DTA 6200- Seiko Instruments Inc.	N
Mass Spectrometer	2010	Pfeifer	N
Differential Scanning Calorimeter (DSC)	2011	Q-20 -TA Instruments	N
Particle sizer couled with zeta potential analyzer	2011	Zetasizer Malvern Instruments	N
Surface area and porosity analyzer	2012	TriStar II 3020 -Micromeritics	N
potentiostat	2016	PGSTAT302N - Metrohm	Y
Desktop Dip Coater	2009	PTL-MM01 -MTI Corporation	N
Glove Box	2016	Inert	N

Table 4.4. Prof. Kurtzman research lab equipment.

Lab: Kurtzman

Equipment	*Year Acquired*	*Manufacturer and Model*	*Service Contract (Y/N)*
Computational cluster server	2012	The cluster consists of 12 total nodes, 2 head nodes, 5 CPU nodes, and 5 GPU nodes running CentOS 7. The two head nodes (8-core Intel Xeon CPU, 128GB RAM) maintain a doubly redundant array of hard drives with over 200 terabytes of storage which is NSF mounted across the compute nodes and the lab work stations. Each of the compute nodes has at least 4TB of local scratch disk space in addition to a dedicated solid state drive for the operating system (250GB or greater). Four CPU nodes consist of 4x12 core AMD "Magny-Cours" Opteron Servers (144 total cores) outfitted with 512GB, 2x128GB, or 64GB of shared memory. A fifth CPU node has a Xeon 40 core E5-4600 CPU and 1 terabyte of memory. The six GPU nodes house 2 NVIDIA M2075 GPUs (448 CUDA cores each), 16 GTX 980, 8 GTX 2080 and 8 GTX 1080Ti GPUs.	N

Table 4.5. Prof. Mallikaratchy research lab equipment.

Lab:Mallikaratchy			
Equipment	*Year Acquired*	*Manufacturer and Model*	*Service Contract (Y/N)*
DNA/RNA SYNTHESIZER	2014	APPLIED BIOSYSTEM MODEL 394	N
NUCLEIC ACID SYNTHESIS SYSTEM	2019	EXPEDITE MODEL	N
GEL DOC EZ IMAGER	2016	BIO RAD MODEL	N
GEL ELETROPHORISIS SYSTEMS	2018	BIO RAD MODEL	N
GEL ELETROPHORISIS SYSTEMS	2018	BIO RAD MODEL	N
GEL ELETROPHORISIS SYSTEMS	before 2012	BIO RAD MODEL	N
300 UV-VIS SPECTROMETER	before 2012	EVOLUTION MODEL EVO300 LC	N
ISOTEMP INCUBATOR	2013	FISHER SCIENTIFIC MODEL	N
QUBIT FLUOROMETER	2018	THERMO FISHER MODEL 4	N
MICROSCOPE	Before 2012	FISHER SCIENTIFIC MODEL MICROMASTER	N

MICROSCOPE	before 2012	FISHER SCIENTIFIC MODEL MICROMASTER	N
MICROSOPE	2018	FISHER SCIENTIFIC MODEL MICROMASTER	N
PCR WORKSTATION	2013	FISHER SCIENTIFIC MODEL 3560000	N
CARY ECLIPSE FLUORESCENSE SPECTROPHOTOMETER	2016	AGILENT TECHNOLOGIES MODEL G9800A	N
HYBRID MULTI-MODE READER	before 2012	BIOTEK MODEL SYNERGY H1	N
SEPARATIONS MODULE	2013	WATERS MODEL 2690	N

Table 4.6. Prof. McGregor research lab equipment.

Lab: McGregor			
Equipment	*Year Acquired*	*Manufacturer and Model*	*Service Contract (Y/N)*
Semi-automated peptide synthesizer and microwave reactor	2016	Biotage Initiator + SP wave	Y
Sonic Dismembrator	2019	Fisher FB-120	N
Atomic Force Microscope	2017	Bruker Innova with liquid and solids sample holders	N
HPLC	2016	Thermoscientific Ultimate 3000 HPLC Fraction collector, automated sample injection for analytical runs, manual for preporatory HPLC. UV-Vis diode detector	N
Infrared spectrometer	2016	Perkin Elmer Spectrum 2 with ATR accessory	Y
UV-Visible spectrometer	2016	Thermoscientific Evolution 220	N
Gas Chromatograph	? (Dept inst)	Thermoscientific TRACE 1300	N
Lyophilizer	2016	Labconco Freezone 2.5+	N

Table 4.7. Prof. O'Connor research lab equipment.

Lab: O'Connor			
Equipment	*Year Acquired*	*Manufacturer and Model*	*Service Contract (Y/N)*

UV/Vis spectrophotometer	2009	Perkin Elmer Lambda 35	N
Fluorescence spectrophotometer	2009	Perkin Elmer LS 55	N
HPLC	2009	Shimadzu Prominence LC	N
Uniaxial tester	2016	Cellscale Univert	N
GCMS	2010	Shimadzu QP-2010 Plus	N
Microplate Reader	--	Biotek Synergy HT	N

Chapter 5

Faculty and Staff

As stated in the Introduction, the department now boasts 12 full-time faculty members (Table 5.1) and 4 full-time laboratory technicians (Table 5.2). All of the department's full-time faculty are PhD educated scientists with most of them research active. Their curriculum vitaes are included within this report. The research of our faculty is varied and many faculty members also supervise graduate students from the Chemistry and Biochemistry programs of The Graduate Center, CUNY. Chemistry department faculty have had significant success in obtaining grant funding, totaling $12,915,577 awarded to department faculty from 7/11/2012 to 9/20/2019. Faculty have been focused on improving the department's majors which have increased more than 300% from 35 students in 2012 to 113 in 2018. This was done in part by adopting a new approach in gateway introductory courses by using a flipped model. This has boosted the passing rate to >80% and has also contributed to attracting students to the chemistry major.

The chemistry department's adjunct faculty are a mixture of PhD educated scientists, graduate students and post-baccalaureates (Table 5.3). Lectures are reserved for PhD educated scientists. The department has also adopted a post-bac policy to provide adjunct opportunities to recent graduates. Adjunct opportunities are open to graduates that meet the requirements and they are encouraged to stay no longer than 2 years. These post-bacs teach predominantly general and organic chemistry lab courses while working closely with a coordinator that is a full-time faculty member. This program has been a great assistance to our students as they apply from graduate and medical programs.

Table 5.1. Full-time Chemistry Department Faculty in 2019

Faculty	**Title**	**Field**
Benjamin Burton-Pye	Assistant Professor	Inorganic Radiochemistry
Columba de la Parra	Assistant Professor	Biochemistry
Melissa Deri	Assistant Professor	Inorganic Radiochemistry
Iraj Ganjian	Professor	Organic Chemistry

Andrei Jitianu	Professor and Chair	Inorganic Chemistry
Thomas Kurtzman	Associate Professor	Computational Chemistry
Marc S. Lazarus	Professor	Physical Chemistry
Gustavo E. Lopez	Professor	Physical Chemistry
Prabodhika Mallikaratchy	Associate Professor	Chemical biology/Biochemistry
Donna McGregor	Assistant Professor	Analytical/Inorganic Chemistry
Pamela Mills	Professor and Dean of the School of Natural and Social Sciences	Physical Chemistry
Naphtali A. O'Connor	Associate Professor	Organic Chemistry

Table 5.2. Full-time College Technician Staff in 2019

Staff	**Title**
Sarswati Amarante	Senior College Laboratory Technician
Sharif Elhakem	Chief College Laboratory Technician
Bibi N. Gafur	Senior College Laboratory Technician
Habib Girgis	Senior College Laboratory Technician
Susan Garcia	Department Secretary

Table 5.3. Adjunct Chemistry Department Faculty from 2012-2019

Name	Highest Degree	Relationship to Lehman	Semesters Taught	Courses Taught
Djabir Adam	BS		2	115
Grant Akalonu	BS	Alumni	5	121 166 167 168 169
Craig Allen	PhD		4	233 235
Sarswati Amarante	MS	CLT	7	115
Joekeem Arizala	BS	Alumni	1	115
Gianluca Arianna	BS		1	121
Meloday Baez	BS		3	115 166 167 168
Juan Barquero	PhD	Alumni	11+	115 121 167 245
Stacy Bassoo	BS	Alumni	6	115 121
Sana Batool	BS	Alumni	1	169

Jian Bian	MS	Alumni	3	115 121
Sana Batool	BS	Alumni	2	169 249
Colleen Brent	BS	Grad Student	1	168
Hannah Brooks	MS		2	166 168
Ekta Bhatia	PhD		1	115
Lucy Bickerton	BS		1	235
Lagree Burke	PhD		1	169
Michael Castaldi	BS		1	233 235
William Centeno	BS	Alumni & Grad Student	1	121 233
Shami Chakrabarti	MS		2	167
Raghu Ram Chamala	PhD		4	115 120 121 235
Lieyang Chen	BS	Alumni	2	167
Christina Clement	PhD		9	169 233 235 244 245 444 446 447
Jonas Cohen	BS		1	121
Joseph Cruz	BS	Alumni	2	249 347
Anthony Cruz-Balberdy	MS	Alumni & Grad Student	3	115 169 347
Melissa Deri	PhD	Post-doc	3	114 121
Tushini De Soyza	PhD		6	115 121 167
Sharif Elhakem	MS	CLT	11+	167 169 233 235
Martin Epstein	PhD		2	115 235
Ebenezer Ewul	MS	Alumni	4	115 169 447
Kristina Fabijanic	BS		2	116 168
Andre Ferguson	BS	Alumni	4	115 167 233 234 235
Hilliary Frank	BS	Alumni	1	115
Mossa Ghattas	BS	Grad Student	1	167
Habib Girgis	BS	CLT	11+	167 233
Kimberly Gonzalez	BS	Alumni	9	115 121 167 169
John Hand	PhD		1	114 232
Emily Hill	BS		2	166 168
Kunhui Huang	BS	Alumni	3	115 167
Chinelle Hutchinson	BS	Alumni	1	169 233
Yeonji Ji	BS	Alumni	1	167
Jessica Jimenez	MS		4	167
Wildly Joseph	BS	Alumni	1	233 234 235
Shuvashish Kundu	PhD		2	114 115 121
Ivana Radivojevic-Jovanovic	PhD		1	115 167
Alexandro Lopez	BS		4	115 167 169
Gabriel Lopez Morales	BS	Alumni	2	345 347
George Maio	BS	Alumni	2	121 167 245
Robert Magee	BS	Alumni	2	233 235
Rahashree Maitra	PhD		9	115 121 169 233
Olga Martyniuk	BS	Alumni	1	115

Francine Morris	PhD		2	166 169
Vicente Navarro-Pareja	MS		7	115 121 169 233 235
Lars Nordstroem	PhD		3	166 168
Binh Nguyen	BS	Alumni	7	114 115 121 167 345 447
Victoria Olaseun	BS		2	115 121
Laura Oliveira	MS		8	115 121 166 168 249 450
Brian Olson	PhD	Alumni & Grad Student	8	114 115 120 121 167 245
Tugba, Oncu	BS		1	121
Ainsley Parkinson	→ PhD	SLC	1	115
Patricia Gonzalez Periche	MS → PhD	Grad Student & Postdoc	3	121 169 232 234
Polin Petkov	BS	Alumni	1	447
Jason Polisar	PhD		11+	115 120 121
Shejla Pollozi	BS	Grad Student	4	166 168
Picard Quentin	BS	Alumni	1	167
Steven Ramsey	BS	Alumni	6	155 167 169 245
Malini Ravi	PhD		11+	114 115 120 121 167 169
Gabriela Rodriquez	BS		5	115 167 169
Kona Senevirathne	PhD		2	114 115
Elizabeth Siaw	BS		1	121
Gerald Spielholtz	PhD	Emeritus Prof	4	115 167 249
Aanchal Tyagi	BS	Alumni	6	114 167 169 232 233 234 235 245 345
Aleksandra Urbanska	BS		1	233
Natan Vega-Potler	BS	Alumni	2	168
Nicole William	BS	Alumni	3	115
Madeline Wong	BS	Alumni	3	115 249 443
Mary Wright	PhD		1	233
Hasan Zumrut	MS	Alumni	5	115 167 169 245

Chapter 6

Departmental plan

2012 Department Goals: A Retrospective

In 2012, the Chemistry Department compiled the Self-Study Report that preceded this report. The 2012 report detailed a 5-year plan for the department. To assess the success and the trajectory of the department, an excerpt of the 2012 5-year plan is included below:

The department has recently completed a 5-year plan and this has a clear vision for the department and goals for both facilities (including personnel) and targets for expansion of teaching and research. These dovetail with those of the college. However, they also have elements that are specific to the department. The opening of the new science building on campus will herald a welcome step change in facilities and environment. In 2012, 2 teaching and 2 research laboratories will be moving into the new science building and these new laboratories will be fitted out with new equipment. The bulk of the department will move into phase II of the building which will open 2015/2016.

Our vision for chemistry is for it to become a key science department within Lehman and CUNY, known for the quality of its students who are fit for purpose as chemists and biochemists in today's competitive skill driven market. In addition, we intend to become a science resource for local schools and the wider community. This vision will be achieved directly or indirectly through the implementation of the following goals:

1. *To increase the number of chemistry majors.*
2. *To increase the number of faculty in the department of chemistry.*
3. *To improve the successful transition of students through our gate keeper courses.*
4. *To update existing curricula with a particular focus on laboratories.*
5. *To develop links with industry with respect to teaching and research.*
6. *To develop both masters and professional masters courses in chemistry.*

7. *To increase research activity in the department at graduate and undergraduate levels.*
8. *To increase outreach activities to local schools through the use of shared resources, staff and facilities.*
9. *To improve the training of chemistry teachers within local schools.*

2012 Goal Assessment

The goals set forth in 2012 centered around growth and raising the profile of the Department within Lehman College and CUNY. Below is the Chemistry Department's assessment of those objectives:

1. **To increase the number of chemistry majors.** *The Department has witnessed a significant growth in the number of majors over the last 5 years. From 2012 to 2018 the number of majors grew from 35 to 113.*
2. **To increase the number of faculty in the department of chemistry.** *The Chemistry department has made some strategic hires and 5 new faculty have been added to the department since 2014 with 2 retirement.*
3. **To improve the successful transition of students through our gate keeper courses.** *We have implemented new, cutting edge pedogeological strategies to address some of the bottle-necks associated with our introductory courses (namely General Chemistry and Organic Chemistry). We currently use a 'flipped' teaching modality in General Chemistry, supported with active learning sessions using personal response devices. Organic Chemistry has introduced more active learning components to aid student success as well as online-support and increased class time.*
4. **To update existing curricula with a particular focus on laboratories.** *The general chemistry laboratory courses and the health science general and organic chemistry laboratory courses have all undergone a redesign during this period. The department has increased in size to the point that it has been able to run Instrumental Analysis which wasn't offered for many years. This course focuses on the instrumentation and provides students with hands on experience with instruments widely used in academia and industry, including HPLC and GCMS. The department also expanded Inorganic Chemistry from a 1-semester course into a 2-semester course.*

5. **To develop links with industry with respect to teaching and research.** *This is an area that continues to require improvement. However the department has made a connection with Perrigo Inc. a multinational over-the-counter pharmaceutical and consumer product company with a facility in the Bronx. Over the past 4 years they have donated 2 used HPLC and 1 used GC systems to the department.*
6. **To develop both masters and professional masters courses in chemistry.** *The department has not developed Masters courses or a Masters program. The focus has been on the growth of the undergraduate program. In addition, the department's participation within the The Graduate Center's Chemistry and Biochemistry programs has grown, with a number of faculty mentoring PhD students.*
7. **To increase research activity in the department at graduate and undergraduate levels.** *The addition of more faculty and a greater willingness to host undergraduates in a research setting has increased the number of students engaged in research to ~28. Faculty are actively engaged in teaching and committee activities at the CUNY Graduate Center and we now have 9 graduate students located at Lehman College.*
8. **To increase outreach activities to local schools through the use of shared resources, staff and facilities.** *This has been an area of great pride for the department. Several faculty members participate in the CollegeNow program hosting high school students in their labs over the summer. Professors Mcgregor and Lopez were recently awarded a NSF REU grant in conjunction with City College and Lehman will host several undergraduate in summer research.*
9. **To improve the training of chemistry teachers within local schools.** *This continues to be an area that requires improvement. Work in this area was previously done in collaboration with the Department of Education. Synergy between the departments needs to be revived.*

2020 Goals and the Path Forward

The chemistry department has grown over the last 5 years and the goals and vision of the department align with this growth. To keep the momentum and profile of the department rising, our goals for the next 5 years are:

A) **Department growth**

1. 200 majors by 2025. In the last 5 years the increased from 70 majors to almost 140-150, and the department believes there is more room for growth.

2. 13 faculty by 2025. The department currently has 10 faculty + 1 clinical professor. To continue to provide quality instruction to the growing student numbers in service courses and courses for majors, the department faculty will also need to grow.

3. Increasing the number of permanent technicians for the New Science building. The target is to have one additional technician by 2025. As with faculty, this is necessary to serve the growth seen in service and major courses.

B) **Undergraduate Research**

1. Provide one tenth of our majors with research opportunities as the department grows. These opportunities include research at external institutions.

2. Increase the amount of majors that participate in REU programs.

3. Create the opportunity for industrial and government internships.

C) **Graduate Research**

1. Build and maintain a community of graduate students at Lehman.

2. Study the feasibility to develop a Master program at Lehman College in order to retain the most talented students in their gap year.

D) **Teaching**

1. Development and deployment of 1-2 elective courses to broaden our offerings to students to help stimulate their interest in chemistry.

2. Improving student preparation for immediate employ by better hands-on training on equipment. Incorporating these improvements into the labs.

3. Increase the emphasis on using peer reviewed literature and improving scientific writing into upper-level courses.

4. Development of new major tracks such as environmental chemistry, sustainability, Medicinal chemistry, Law and Chemistry and regulatory Affairs or Cheminformatics.

5. Updating the Learning Objectives for the program to reflect 21st century learning strategies and post-graduation needs.

E) **Broader Participation**

1. Improving industry ties, with an eye on improving undergraduate internship and employment opportunities and to assist in developing a Masters program.

2. Development of a student led Undergraduate Chemistry Club with ACS affiliation.

3. Encourage collaboration within the School of Natural and Social Sciences especially with Biology, Physics and EGGS.

4. Development of new links with other CUNY Colleges and especially with the Advanced Research Science Center (ARSC).

5. Create links with the new Nano- Master program developed by The Graduate Center.

6. Encourage the development of "Collaborative" applications for federal funded grants.

Appendix A

Faculty *C.V*

CURRICULUM VITAE

Benjamin P. Burton-Pye
Assistant Professor, Department of Chemistry, Lehman College

EDUCATION

2005 – 2009	Postdoctoral Associate	Hunter College, CUNY
2004 – 2005	Postdoctoral Associate	University of Manchester & British Nuclear Fuels Ltd.
2001 – 2004	PhD. Inorganic Chemistry	University of Manchester
1997 – 2001	BSc (Hons) Environmental and Analytical Chemistry	University of Surrey

CAREER DETAILS

2015 – present	Assistant Professor, Department of Chemistry, Lehman College
2015 – present	Assistant Professor, PhD Program in Chemistry, CUNY Graduate Center
2013 – 2015	Research Associate Staff Scientist, Department of Chemistry and Biochemistry, Hunter College
2013 – 2015	Radiochemistry IGERT Coordinator, Department of Chemistry and Biochemistry, Hunter College
2010 – 2013	Senior Research Associate, Department of Chemistry and Biochemistry, Hunter College
2010 – 2015	Radiation Safety Training Officer, Hunter College

MEMBERSHIPS
American Chemical Society
Royal Chemical Society
Society of Radiopharmaceutical Sciences

TEACHING
Organic Chemistry I (CHE 232)
Organic Chemistry II (CHE 234)
Instrumental Analysis (CHE 449)
Essentials of Organic Chemistry (CHE 120)
Essentials of Organic Chemistry Laboratory (CHE 121) & sequence coordinator
Chemical Investigations (CHE 391/491)

RESEARCH

- Development of "smart" persistently luminescent particles for security encoding and bioimaging applications.
- Development of multi-functionalized cyclen derivatives for bioimaging and radiotherapy.
- Electro- and chemiluminescence of ruthenium compounds.

- Investigation of actinides within the bonds of polyoxometalate metal clusters.
- Development of low-cost fluorescence spectrometers for teaching applications.

RESEARCH FUNDING

2016 – 2021 NIH SCORE $300,000

PUBLICATIONS

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2. Burton-Pye, Benjamin P.; Poineau, Frederic; Bertoia, Julie; Czerwinski, Kenneth R.; Francesconia, Lynn C.; Sattelberger, Alfred P.; Photochemical behavior of the quadruply metal-metal bonded $[Tc_2Cl_8]^{2-}$ anion in acetonitrile. Inorganica Chimica Acta. **2016**, 453, 724-727. DOI: 10.1016/j.ica.2016.09.041
3. Bera, Mrinal K.; Qiao, Baofu; Seifert, Soenke; Burton-Pye, Benjamin P.; Oliviera de la Cruz, Monica; Antonio, Mark R.; Aggregation of Heteropolyanions in Aqueous Solutions Exhibiting Short-Range Attractions and Long-Range Repulsions. Journal of Physical Chemistry C. **2016**, 120, 1317-1327. DOI: 10.1021/acs.jpcc.5b10609
4. Deri, Melissa; Ponalla, Sashikanth; Kozlowski, Paul; Burton-Pye, Benjamin P.; Cicek, Husseyin; Hu, Chinua; Lewis, Jason S.; Francesconi, Lynn C; p-SCN-BN-HOPO: A Superior Bifunctional Chelator for Zr ImmunoPET. Bioconjugate Chemistry. **2015**, 26, 2579-2591. DOI: 10.1021/acs.bioconjchem.5b00572
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7. McGregor, Donna; Burton-Pye, Benjamin P.; Lukens, Wayne W.; Francesconi, Lynn C.; Insights into stabilization of the $^{99}Tc^{V}O$ core for synthesis of $^{99}Tc^{V}O$ compounds. European Journal of inorganic Chemistry. **2014**, 6, 1082-1089. DOI:- 1 0.1002/ejic.201301034
8. Poineau, Frederic; Weck, Philippe F.; Burton-Pye, Benjamin P.; Kim, Eunja; Francesconi, Lynn C.; Sattelberger, Alfred P.; German, Konstantin E.; Czerwinski, Kenneth R.; Diperoxo Pertechnetic Acid Characterized by Spectroscopic and Quantum Chemical Studies. European Journal of inorganic Chemistry. **2013**, 26, 4595-4600.

9. Poineau, Frederic; Burton-Pye, Benjamin P.; Maruk, Alesya; Kirakosyan, Gayane: Denden, Ibthihel; Rego, Daniel B.; Johnston, Erik V.; Sattelberger, Alfred P.; Fattahi,

Massoud; Francesconi, Lynn C.; German, Konstantin E.; Czerwinski, Kenneth R.; On the Nature of Heptavalent Technetium in Concentrated Nitric and Perchloric Acid. Inorganica Chimica Acta; **2013**, 398, 147-150.

10. Poineau, Frederic; Weck, Philippe F.; Burton-Pye, Benjamin P.; Denden, Ibthihel ; Kim, Eunja; Kerlin, William; Maruk, Alesya; Kirakosyan, Gayane; German, Konstantin E.; Fattahi, Massoud; Francesconi, Lynn C.; Sattelberger Alfred P.; Czerwinski, Kenneth R.; Reactivity of Pertechnetic Acid in Sulfuric Acid: Technetium Sulfates Complexes Revealed by X-ray Absorption Spectroscopy and First Principles Calculations. Dalton Transactions;
2013, 42, 4348-4352.
11. Radivojevic, Ivana; Ithisuphalap, Kemakorn; Burton-Pye, Benjamin P.; Saleh, Raihan; Francesconi, Lynn C.; Drain, Charles M.; Ternary phthalocyanato Hf(IV) and Zr(IV) polyoxometalate complexes. Royal Society of Chemistry Advances; 2013, 3, 2174-2177.
12. McGregor, Donna; Burton-Pye, Benjamin P.; Mbomekalle, Israel M.; Aparicio, Pablo A.; Romo, Susanna; Lopez, Xavier; Poblet, Josep M.; Francesconi, Lynn C.; ^{99}Tc and Re Incorporated into Metal Oxide Polyoxometalates: Oxidation State Stability Elucidated by Electrochemistry and Theory. Inorganic Chemistry; **2012**, 51(16), 9017–9028.
13. Radivojevic, Ivana; Bazzan, Giorgio; Burton-Pye, Benjamin P.; Ithisuphalap, Kemakorn; Saleh, Raihan; Durstock, Michael F.; Francesconi, Lynn C.; Drain, Charles M.; Zirconium(IV) and Hafnium(IV) Porphyrin and Phthalocyanine Complexes as New Dyes for Solar Cell Devices. Journal of Physical Chemistry C; **2012**, 116(30), 15867–15877.
14. Burton-Pye, Benjamin P.; Jones, India; Cutler, Cathy S.; Howell, Robertha C.; Francesconi, Lynn C.; Investigation into the extraction speciation of rare-earth radioisotopes from aqueous solution using polyoxometalates. Inorganica Chimica Acta; **2012**, 380, 236-243.
15. Tilney, James A.; Sorensen, Thomas Just; Burton-Pye, Benjamin P.; Faulkner, Stephen.; Self-assembly between dicarboxylate ions and a binuclear europium complex: formation of stable adducts and heterometallic lanthanide complexes. Dalton Transactions; **2011**, 40(45), 12063-12066.
16. Burton-Pye, Benjamin P.; Radivojevic, Ivana; McGregor, Donna; Mbomekalle, Israel M.; Lukens, Wayne W.; Francesconi, Lynn C.; Photoreduction of 99Tc Pertechnetate by Nanometer-Sized Metal Oxides: New Strategies for Formation and Sequestration of Low-Valent Technetium. Journal of the American Chemical Society; **2011**, 133(46), 18802-18815.
17. Burton-Pye, Benjamin P.*; Francesconi, Lynn C.; Speciation of organic-soluble europium(III) α1-Wells-Dawson complexes. Dalton Transactions; **2011**, 40(17), 4421-4433.
18. McGregor, Donna; Burton-Pye, Benjamin P.; Howell, Robertha C.; Mbomekalle, Israel M.; Lukens, Wayne W.; Bian, Fang; Mausolf, Edward; Poineau, Frederic; Czerwinski, Kenneth R.; Francesconi, Lynn C.; Synthesis, Structure Elucidation, and Redox Properties of 99Tc Complexes of Lacunary Wells-Dawson Polyoxometalates:

Insights into Molecular 99Tc-Metal Oxide Interactions. Inorganic Chemistry; **2011**, 50(5), 1670-1681.
19. Antonio, Mark R.; Jing, Jing; Burton-Pye, Benjamin P.; Francesconi, Lynn C.; Series behavior of lanthanoid(III) complexes with the α-1-Wells-Dawson heteropolyoxoanion in acetonitrile: electrochemistry and Ln coordination. Dalton Transactions; **201**0, 39(34), 7980-7992.
20. Falber, Alexander; Burton-Pye, Benjamin P.; Radivojevic, Ivana; Todaro, Louis; Saleh, Raihan; Francesconi, Lynn C.; Drain, Charles M.; Ternary Porphyrinato Hf^{IV} and Zr^{IV} Polyoxometalate Complexes. European Journal of Inorganic Chemistry; **2009**, (17), 2459-2466.
21. Jing, Jing; Burton-Pye, Benjamin P.; Francesconi, Lynn C.; Antonio, Mark R.; Europium(III) reduction and speciation within a Wells-Dawson heteropolytungstate. Inorganic Chemistry; **2008**, 47(15), 6889-6899.
22. Zhang, Cheng; Bensaid, Laurence; McGregor, Donna; Fang, Xikui; Howell, Robertha C.; Burton-Pye, Benjamin; Luo, Qunhui; Todaro, Louis; Francesconi, Lynn C.; Influence of the lanthanide ion and solution conditions on formation of lanthanide Wells-Dawson polyoxotungstates. Journal of Cluster Science; **2006**, 17(2), 389-425.
23. Boglio, Cecile; Lenoble, Geraldine; Duhayon, Carine; Hasenknopf, Bernold; Thouvenot, Rene; Zhang, Cheng; Howell, Robertha C.; Burton-Pye, Benjamin P.; Francesconi, Lynn C.; Lacote, Emmanuel; Production and Reactions of Organic-Soluble Lanthanide Complexes of the Monolacunary Dawson $[\alpha1\text{-}P_2W_{17}O_{61}]^{10-}$ Polyoxotungstate. Inorganic Chemistry; **2006**, 45(3), 1389-1398.
24. Pope, Simon J. A.; Burton-Pye, Benjamin P.; Berridge, Rory; Khan, Tahir; Skabara, Peter J.; Faulkner, Stephen; Self-assembly of luminescent ternary complexes between seven-coordinate lanthanide(III) complexes and chromophore bearing carboxylates and phosphonates. Dalton Transactions; **2006**, (23), 2907-2912.
25. Faulkner, Stephen; Pope, Simon J. A.; Burton-Pye, Benjamin P.; Lanthanide complexes for luminescence imaging applications. Applied Spectroscopy Reviews; **2005**, 40(1), 1-31.
26. Faulkner, Stephen; Burton-Pye, Benjamin P.; pH Dependent self-assembly of dimetallic lanthanide complexes. Chemical Communications; **2005**, (2), 259-261.
27. Burton-Pye, Benjamin P.; Heath, Sarah L.; Faulkner, Stephen; Synthesis and luminescence properties of lanthanide complexes incorporating a hydralazine-derived chromophore. Dalton Transactions; **2005**, (1), 146-149.
28. Faulkner, Stephen; Burton-Pye, Benjamin P.; Khan, Tahir; Martin, Leigh R.; Wray, Steven D.; Skabara, Peter J.; Interaction between tetrathiafulvalene carboxylic acid and ytterbium DO3A: solution state self-assembly of a ternary complex which is luminescent in the near-IR. Chemical Communications; **2002**, (16), 1668-1669.
29. Beeby, Andrew; Burton-Pye, Benjamin P.; Faulkner, Stephen; Motson, Graham R.; Jeffery, John C.; McCleverty, Jon A.; Ward, Michael D.; Synthesis and near-IR luminescence properties of neodymium(III) and ytterbium(III) complexes with poly(pyrazolyl)borate ligands. Journal of the Chemical Society, Dalton Transactions;

2002, (9), 1923-1928.

CURRICULUM VITAE

Columba de la Parra
Assistant Professor, Department of Chemistry
Lehman College, City University of New York

EDUCATION

2015-2019 Postdoctoral Fellow, NYU School of Medicine
2009-2014 Ph.D. in Biochemistry, Medical Sciences Campus, University of Puerto Rico
2003-2006 M.Sc. Biotechnology, Monterrey Institute of Technology (ITESM) and Cornell University
1998-2002 B.Sc. Engineering, Monterrey Institute of Technology (ITESM)

CAREER DETAILS

2019-present Assistant Professor, CUNY-Lehman College
2019-present Visiting Assistant Professor, NYU School of Medicine
Spring 2019 Adjunct Assistant Professor, CUNY- John Jay College
2015-2019 Postdoctoral Researcher, NYU School of Medicine
2011-2014 Lecturer and Graduate Research Assistant

AWARDS

2016 Postdoctoral Fellowship Award- American Cancer Society
2015 Postdoctoral Fellowship Molecular Oncology Training-NYU
2014 UPR-MSC Academic Recognition: Ph.D., Honor student and Research Award
2011 Predoctoral Traineeship Award. Breast Cancer Research Program, DoD
2010 Minority Biomedical Research Support MBRS-RISE Program
2010 AICR travel award
2006 ITESM-Scholarship: "Nutraceutical food treatment of chronic disease"

MEMBERSHIPS

American Society for Biochemistry and Molecular Biology (ASBMB)

TEACHING

- CHE 444 Biochemistry I Lecture
- CHE 447 CHE 447 Biochemistry Laboratory
- CHE 391 Chemical Investigations

RESEARCH

- Metabolism and Breast Cancer
- mRNA Translational control and cancer
- Molecular mechanisms by which bioactive compounds in plants and food act on chronic diseases

RESEARCH FUNDING

2016-2019. American Cancer Society (ACS) Postdoctoral Fellowship — Grant PF-16-095-01- RMC $160,00

PUBLICATIONS

1. **de la Parra C**, Ernlund A, Alard A, Ruggles K, Ueberheide B, Schneider RJ. A widespread alternate form of cap-dependent mRNA translation initiation. Nat Commun. 2018 Aug 3;9(1):3068. PubMed PMID: 30076308
2. **de la Parra C**, Walters BA, Geter P, Schneider RJ. Translation initiation factors and their relevance in cancer. Curr Opin Genet Dev. 2018 Feb;48:82-88. doi: PubMed PMID: 29153484.
3. **de la Parra C**, Castillo-Pichardo L, Cruz-Collazo A, Cubano L, Redis R, Calin GA, Dharmawardhane S. Soy Isoflavone Genistein-Mediated Downregulation of miR-155 Contributes to the Anticancer Effects of Genistein. Nutr Cancer. 2016;68(1):154-64. PubMed PMID: 26771440
4. **de la Parra C**, Borrero-Garcia LD, Cruz-Collazo A, Schneider RJ, Dharmawardhane S. Equol, an isoflavone metabolite, regulates cancer cell viability and protein synthesis initiation via c-Myc and eIF4G. J Biol Chem. 2015 Mar 6;290(10):6047-57. PubMed PMID: 25593313
5. Cekanova M, Fernando RI, Siriwardhana N, Sukhthankar M, **De la Parra** C, Woraratphoka J, Malone C, Ström A, Baek SJ, Wade PA, Saxton AM, Donnell RM, Pestell RG, Dharmawardhane S, Wimalasena J. BCL-2 family protein, BAD is down-regulated in breast cancer and inhibits cell invasion. Exp Cell Res. 2015 Feb 1;331(1):1-10. PubMed PMID: 25499972
6. Castillo-Pichardo L, Humphries-Bickley T, **De La Parra C**, Forestier-Roman I, Martinez-Ferrer M, Hernandez E, Vlaar C, Ferrer-Acosta Y, Washington AV, Cubano LA, Rodriguez-Orengo J, Dharmawardhane S. The Rac Inhibitor EHop-016 Inhibits Mammary Tumor Growth and Metastasis in a Nude Mouse Model. Transl Oncol. 2014 Oct;7(5):546-55. PubMed PMID: 25389450.
7. **de la Parra C**, Otero-Franqui E, Martinez-Montemayor M, Dharmawardhane S. The soy isoflavone equol may increase cancer malignancy via up-regulation of eukaryotic protein synthesis initiation factor eIF4G. J Biol Chem. 2012 Dec 7;287(50):41640-50. PubMed PMID: 23095751

8. **de la Parra C**, Saldivar SO, Liu RH. Effect of processing on the phytochemical profiles and antioxidant activity of corn for production of masa, tortillas, and tortilla chips. J Agric Food Chem. 2007 May 16;55(10):4177-83. PubMed PMID: 17455952.
9. Serna-Saldivar SO, Zorrilla R, **De La Parra C**, Stagnitti G, Abril R. Effect of DHA containing oils and powders on baking performance and quality of white pan bread. Plant Foods Hum Nutr. 2006 Sep;61(3):121-9. doi: 10.1007/s11130-006-0009-5. PubMed PMID: 17031604.

CURRICULUM VITAE

Melissa A. Deri
Assistant Professor, Department of Chemistry, Lehman College, CUNY

EDUCATION

2010-2015 PhD in Chemistry, Hunter College and the Graduate Center, CUNY
2010-2011 MS in Chemistry, New York University
2006-2010 BA in Chemistry, New York University

CAREER DETAILS

2018-Present Assistant Professor of Chemistry, Graduate Center, CUNY
2017-Present Assistant Professor of Chemistry, Lehman College, CUNY
2015-2017 Postdoctoral Fellow, Lehman College, CUNY
2015 Postdoctoral Fellow, Memorial Sloan Kettering Cancer Center

AWARDS

2019 Highlighted on “Ones to Watch” list of early career professionals, Society of Nuclear Medicine and Molecular Imaging
2014 PhD Faculty Fellow, Center for Advanced Study in Education, Graduate Center CUNY

MEMBERSHIPS

- American Chemical Society (ACS)
- World Molecular Imaging Society (WMIS)
- Society of Radiopharmaceutical Sciences (SRS)
- Society of Nuclear Medicine and Molecular Imaging (SNMMI)
- New York Academy of Sciences (NYAS)
- Phi Beta Kappa National Honor Society
- Phi Lambda Upsilon National Chemistry Honor Society

TEACHING

- Advanced Inorganic Chemistry at the Graduate Center
- Essentials of General Chemistry
- Essentials of General Chemistry Laboratory

- College Now General Chemistry
- Essentials of Organic Chemistry Laboratory

RESEARCH

- Radiopharmaceutical drug development
- Investigation and evaluation of radiometal chelators
- Theranostic radionuclide pairs
- Isotope production
- Chemical education research
- Innovative pedagogy
- Technology driven and online course development

RESEARCH FUNDING

2019-2022 Support of Competitive Research (SCORE) Pilot Project Award (SC2), National Institutes of Health, Chelator development for improved scandium theranostic agents. PI: Deri.

2018-2019 Visiting Faculty Program, Department of Energy Office of Science, Improving the accessibility of scandium radionuclides through optimizing production, separations, and radiolabeling protocols, with Brookhaven National Laboratory, Co-PIs: Deri/Cutler.

2017-2020 Lehman College Start-Up Funding

2017-2019 CUNY Graduate Research and Technology Initiative (GRTI) Start-Up Funding

PUBLICATIONS

1. Bhupathiraju, N. V. S. D. K.; Younes, A.; Cao, M.; Ali, J.; Cicek, H. T.; Tully, K. M.; Ponnala, S.; Babich, J. W.; Deri, M. A.; Lewis, J. S.; Francesconi, L. C.; Drain, C. M. Improved Synthesis of the Bifunctional Chelator p-SCN-Bn-HOPO. Org Biomol Chem (accepted 2019).
2. Deri, M. A.; Mills, P.; McGregor, D. Structure and Evaluation of a Flipped General Chemistry Course as a Model for both Small and Large Gateway Science Course at an Urban Public Institution. Journal of College Science Teaching: 2018; Vol. 47, pp 46-55.
3. Deri, M. A.; McGregor, D.; Mills, P., Using Technology To Flip and Structure General

Chemistry Courses at a Large Public University: Our Approach, Experience, and Outcomes. In Teaching and the Internet: The Application of Web Apps, Networking, and Online Tech for Chemistry Education, American Chemical Society: 2017; Vol. 1270, pp 75-97.
4. Deri, M. A.; Ponnala, S.; Kozlowski, P.; Burton-Pye, B. P.; Cicek, H. T.; Hu, C.; Lewis,
J. S.; Francesconi, L. C. *p*-SCN-Bn-HOPO: A Superior Bifunctional Chelator for ^{89}Zr ImmunoPET. Bioconjugate Chem 2015; 26(12):2579-2591.
5. Deri, M. A.; Ponnala, S.; Zeglis, B. M.; Pohl, G.; Dannenberg, J. J.; Lewis, J. S.; Francesconi, L. C. An Alternative Chelator for ^{89}Zr Radiopharmaceuticals: Radiolabeling and Evaluation of 3,4,3-(LI-1,2-HOPO). J Med Chem 2014; 57(11):4849-4860.
6. Deri, M. A.; Zeglis, B.M.; Francesconi L. C.; Lewis, J. S. PET imaging with ^{89}Zr: From radiochemistry to the clinic. Nucl Med Biol 2013;40:3-14.

CURRICULUM VITAE

Iraj Ganjian
Professor of Chemistry
Lehman College, City University of New York

EDUCATION
Pharm. D., School of Pharmacy, Teheran University, Iran, 1968
M. S., College of Pharmaceutical Sciences, Colombia University, 1973
M. PH., Chemistry Department, Columbia University; 1975
Ph. D., Chemistry Department, Columbia University; 1977
Postdoctoral Research. College of Natural Resources, Uiversity of California at Berkeley, 1979-1981

CAREER DETAILS
Professor, Lehman College, City Universtiy of New York, 1/92-present.
Associate Professor, Lehman College, City University of New York, 1/85-1/92.
Assistant Professor, Lehman College, City University of New York, 9/81-1/85
Postdoctoral Research Fellow, College of Natural Resources, University of California, Berkeley, 9/79-9/81
Assistant Professor, Institute of Biochemistry and Biophysics, Teheran University, Iran, 9/77-9/79

MEMBERSHIPS
American Chemical Society & Organic Chemistry Division
The Society of Sigma Xi
Rho Chi Honor Society

TEACHING

For science majors:

General Chemistry-Lecture I and II, Lab I and II
Organic Chemistry-Lecture I and II, Lab I and II
Medicinal Chemistry
Qualitative Organic Chemistry, Structure Determination and Organic Analysis,

For non-science majors:

Essentials of General Chemistry-Lecture and Lab
Essentials of Organic Chemistry-Lecture and Lab
Elements of Chemistry
Problem Solving through Quantitative Reasoning

RESEARCH

It involves basic research involving mechanisms and functional groups transformation in organic compounds.Synthesis of selenium heterocycles and selenium containing amino acids. Natural products; , isolation, identification and separation of biologically activecompounds from medicinal plants.
Area: Natural Products, Carbohydrates, Organoselenides

PUBLICATIONS

● I. Ganjian, M. J. Pettei, K. Nakanishi and K. Kaissling; "A Photoaffinity-Labelled Insect Sex Pheromone for the Moth Antheraea polyphemus." Nature, 271, 157-158 (1978).DOI: 10.1038/271157a0
● I. Ganjian, I. Kubo and T. Kubota; "Rapid and Micro Identification of Biologically Active Diterpenes in Rabdosia umbrosus var excisinflexus (Labiatae) by Reversed Phase High Performance Liquid Chromatography." J. Chromatogr.,200, 250-253 (1980).
● K. Karimian, I. Ganjian and M. Askari; "Evidence for the Involvement of a Tetrahedral Intermediate in the H-D Exchange of C-2 Proton in Thiazolium Ion." Tetrahedron Letters, 22, 581-582 (1981).
● I. Kubo and I. Ganjian; "Insect Antifeedant Terpenes, Hot-tasting to Humans." Experientia, 37, 1063-1064 (1981). DOI: 10.1007/BF02085009
● I. Ganjian, W. Loher and I. Kubo; "Determination of Prostaglandin E2 in the Cricket, Teleogryllus commodus, by Reversed-Phase High Performance Liquid Chromatography." J. Chromatogr., 216, 380-384 (1981). DOI: 10.1016/S0021-9673(00)82371-7
● W. Loher, I. Ganjian, I. Kubo, D. Stanley-Samuelson and S. S. Tobe; "Prostaglandins: Their Role in Egg-laying of the Cricket Teleogryllus commodus." Proc. Natl. Acad. Sci USA, 78, 7835-7838 (1981). PMID 16593135
● I. Kubo, I. Ganjian and T. Kubota; "Chemotaxonomic Significance of Ent-kaurene Diterpenes in Rabdosia umbrosus Varieties." Phytochemistry, 21, 81-83 (1982). DOI: 10.1016/0031-9422(82)80018-6 0.6
● I. Kubo, J. A. Klocke, I. Ganjian, N. Ichikawa and T. Matsemoto; "Efficient Isolation of Phytoecdysones from Ajuga Plants by High-Performance Liquid Chromatography

(HPLC) and Droplet Counter-Current Chromatography (DCCC)."J. Chromatogr., 257, 157-161 (1983).
DOI: 10.1016/S0021-9673(01)88168-1
● I. Ganjian, I. Kubo and P. Fludzinski; "Insect Antifeedant Elemanolide Lactones from Vernonia amygdalina (Compositae)." Phytochemistry, 22, 2525-2526 (1983).DOI: 10.1016/0031-9422(83)80154-X
● I. Ganjian and I. Lalezari; "A Convenient Synthesis of Glycosminine, 4-Quinazolinone Alkaloid, and Related Compounds."Synth. Commun., 14, 33-37 (1984).
DOI: 10.1080/00397918408060861
● I. Ganjian and I. Lalezari; "Synthesis of Selenium Analogs of Glycerol from 1,2,3-Selenadiazoles." J. Heterocyclic Chem., 22, 857-858 (1985).
● W. Loher, I. Ganjian, I. Kubo, D. Stanley-Samuelson and S. S. Tobe; "Location and Synthesis of PGE2 , an Egg-laying Stimulant of the Cricket, Teleogryllus commodus." Current Trends in Comparative Endocrinology, 391-393 (1985).PMID 16593135
● I. Ganjian, I. Lalezari, S. V. DiMeo and L. A. Gomez; "Syntheses of Beta-Hydroxyselenides and Selenides from 1,2,3-Selenadiazoles: SelenophilicReaction of Phenylmagnesium Bromide on Alpha-Selenoketones." J. Heterocyclic Chem., 23, 893-895 (1986).
● I. Ganjian; Sadtler Standard Spectra. Philadelphia: Sadtler Research Laboratories, class=Section2> Supplements (1987). Infrared Spectrograms 71372k-71375K and Nuclear Magnetic Resonance Spectrograms 44356M-44359M. Spectrograms of compounds related to 4-Quinazolinone Alkaloids, published in, Synth. Commun., 14, 33-37 (1984).
● I. Kubo, M. Kim, I. Ganjian, T. Kamikawa and Y. Yamagiwa; "Isolation, Structure and Synthesis of Maesanin, a Host Defense Stimulant from an African Medicinal Plant Maesa Lanceolata." Tetrahedron, 43, 2653-2660 (1987).DOI: 10.1016/S0040-4020(01)86870-8
● T. A. Borgese, J. P. Harrington, I. Ganjian and C. Duran; "Hemoglobin Properties and Polymerization in the Marine TeleostLophius americanus Goosefish)." Comp. Biochem. Physiol., 91B, 663-670 (1988).DOI: 10.1016/0305-0491(88)90189-7
● I. Ganjian; "Preparation of Beta-Hydroxysulfides from 1,2,3-Thiadiazoles. Comparison of the Effect of Phenylmagnesium Bromide on Alpha-Thio and Alpha-Selenoketones." J. Heterocyclic Chem., 27, 2037-2039 (1990).
● I. Ganjian, M. Khorshidi and I. Lalezari; "Synthesis and Cytotoxic Activity of 2 -Dialkylaminoalkyl-1,3-dihydropyrrolo[3,4-c]quinoline-1,3-diones and 6-(2-Dimethylaminoethyl)-1H-dibenz[c,e]azepine-5,7-dione." J. Heterocyclic Chem.,28, 1173-1175 (1991).
● I. Ganjian, R.L. Baumgarten and R.J. Valenzuela; "Using Spin-Spin Decoupling NMR for Structure Elucidation in the Extraction of Cinnamaldehyde."J. Chem. Educ., 68, 511-513 (1992).
● N. D. Sachinvala, H. Chen, W. P. Niemczura, E. Furusawa, R. E.Cramer and I. Ganjian; "Synthesis, Characterization and Anti-cancer Activities of the First Platinum Complexes from Sucrose."J. Med. Chem., 36, 1791-1795 (1993). PMID 8510107
● I. Ganjian and D.V. Basile; "Reductive Syntheses of p-Aminophenyl-$-D-glucoside and its Conversion to $-Glucosyl Yariv Reagent."Analytical Biochemistry, 246, 152-155 (1997).DOI: 10.1006/abio.1997.9974

● N. D. Sachinvala, R. K. Menescal, D. L. Winsor, W. P. Niemczura, M. H. Litt and I. Ganjian; “Sucrose-Based Epoxy Monomers and Their Reactions with Diethylenetriamine.” J. Polym. Sci., Part A: Polym. Chem. 36, 2397-2413 (1998).
● D. V. Basile and I. Ganjian; Beta-D--Glucosyl and Alpha-D-Galactosyl Yariv Reagents; Syntheses from p-Nitrophenyl-D-glycosides by Transfer Reduction Using Ammonium Formate".J.Agric. Food Chem., 52. 7453 - 7456 (2004). DOI: 10.1021/jf0401571
● Ganjian, Iraj, in America's Registry of Outstanding Professionals, Publisher Pizzo andPizzo, Westbury, New York. 6th Ed., Sect.12, SIC 82, 447(2007).
● N. O'Connor, N. Sachinvala, I. Ganjian; “Preparation of 2-Arylethynylselanylacetonitriles from 4-Aryl-1,2,3-Selenadiazoles” J. Heterocyclic Chem., 28, 1167-1169 (2015) .https://doi.org/10.1002/jhet.2216

CURRICULUM VITAE

Andrei Jitianu
Professor of Chemistry and Chair

EDUCATION
2001 - Ph.D. in Physical Chemistry at University of Bucharest, School of Chemistry
1996 - M. Sc. degree in Inorganic Chemistry, University of Bucharest, School of Chemistry
1995 - B. Sc. degree in Chemistry, University of Bucharest, School of Chemistry

CAREER DETAILS
Lehman College, CUNY, Bronx, NY

August 2018-present	Chair of the Department of Chemistry
August 2017-present	Professor of Chemistry, Department of Chemistry
2016-present	Chair of the Inorganic Subdiscipline, Department of Chemistry, The Graduate School and University Center, CUNY, NY, NY
2008-present	Faculty Member of the PhD Program in Chemistry The Graduate School and University Center, CUNY, NY,
2009-present	Faculty Member of the PhD Program in Biochemistry The Graduate School and University Center, CUNY, NY
August 2013 - August 2017	Associate Professor, Department of Chemistry, Lehman College, CUNY, Bronx, NY
September 2012 - December 2014	Deputy Chair of the Department of Chemistry, , Lehman College
Summer 2013, 2015	University of Orleans, Orleans, France Invited Visiting Professor
August 2008 – August 2013	Assistant Professor, Department of Chemistry Lehman College, CUNY, Bronx, NY

September 2005 – August 2008	Research Associate, Department of Materials Science Engineering Rutgers University, New Brunswick, NJ
September 2003 - August 2005	Research Associate, Center for Advanced Materials Processing Clarkson University, Potsdam, NY
2002-2003	Marie-Currie Postdoctoral Fellow, Centre de Recherche sur la Matière Divisée (C.R.M.D.) C.N.R.S. / Université d'Orléans, Orléans, France.
2001-2002	Senior Researcher, Institute of Physical Chemistry, Romanian Academy, Bucharest, Romania.
2000-2001	Postgraduate Researcher, Institute of Physical Chemistry Bremen University, Bremen, Germany.

AWARDS

May, 16 2018 - "ISSO Faculty & Staff Superhero Award" –Lehman College-CUNY
June, 2 2011 - "New Investigator Award" – Lehman, CUNY
May 2010 - "Feliks Gross" Endowment Award CUNY Academy for the Humanities and Sciences
2003 - "Gh. Spacu" Award, given by Romanian Academy "Chemistry of the sol-gel processes in oxide and hybrid systems"
September 2007 - Recipient of International Conference Travel Scholarship from the International Materials Institute for New Functionality in Glass, Lehigh University, Penn State University and National Science Foundation

MEMBERSHIPS

Member of:

- 2003 - present International Sol-Gel Society
- 2004 - present American Chemical Society
- 2006-2012 Sigma-Xi, The Scientific Research Society
- 2008-present New York Academy of Science
- 2009-present American Ceramic Society
- 2012 -2 019 CUNY Academy for Arts and Sciences

- Elected Treasurer of the International Sol-gel Society 2015-Present
- Chair of the International Selection Committee of 2015 Ulrich Awards 2015
- Elected Member of the Board of Directors of the CUNY Academy for Arts and Sciences September 2014 – May 2019
- Member of the Advisory Council to the Research Foundation September 2014 - present
- Elected member of Board of Directors of International Sol-Gel Society August 2013 - present

TEACHING

- **CHE 137, 138**, Chemical Principles for non-majors;
- **CHE 166, 167**, 1st semester General Chemistry Lecture and Laboratory for majors;
- **CHE 442**, Inorganic Chemistry;
- **CHE 443** Advanced Inorganic Chemistry;
- **CHE 449**, redesign and instruction of Instrumental Analysis;
- **CHE 450**, Seminar;
- **CHE 520**, Chemical Principles for Chemistry and Biology Teachers,
- **CHEM 71000** Inorganic Chemistry (Graduate Center), U
- **CHEM 80501**, Inorganic Doctoral Seminar

RESEARCH

My research goals are to develop new materials or composite materials for hermetic barriers for electronic industry, anticorrosive materials for automotive industry and hydroxyapatite based nanocomposite for biomedical applications. The sol-gel process is a versatile method that has the ability to combine inorganic with organic phases producing hybrid organic-inorganic materials. These materials are not simply the sum of the individual contributions of each phase, but unique hybrid materials due to synergistic combinations of properties of both components. My studies range from the elucidation of early stages of formation of the hybrid materials by sol-gel process to the design of hybrid nanocomposite materials with magnetic, gas-sensing, electric and optical properties. My research fulfilled during my years at Lehman was mainly focused to developing a new class of materials called Hybrid Melting Gels for hermetic barriers, anticorrosive and optical applications. Beside this, studies on nanoparticles or nanocomposites in different systems have been carried out. Among the systems investigated, are the following: the formation of stable silver nanoparticles sols, the preparation of core/shell nanoparticles for hydrogen peroxide biosensors and the preparation of LaCoO3 using the sol-gel method.

RESEARCH FUNDING

- Principal Investigator PSC-CUNY Award # 62293-00 50, “Hydroxyapatite based 3D self-healing barriers”, $3,500/1 year (2019-2020)
- Principal Investigator PSC-CUNY Award # 61476-00 49, “A New Approach in Processing of Silisesquioxanes Based Multifunctional Coatings”, $3,500/1 year (2018-2019)
- Principal Investigator NSF Award #1313544, Materials World Network, SusChEM: Hybrid Sol-Gel Route to Chromate-free Anticorrosive Coatings $ 605,000/5 years (2014-2019)
- Principal Investigator PSC-CUNY Award # 67236-00 45, “A new approach in manufacturing of thin film Lithium-Ion Microbattery” $3,498.72/1 year (2014-2015)
- Principal Investigator PSC-CUNY Award # 66343-00 44, “Mesoporous Mg-Cr hydrotalcite type compounds obtained by sol-gel method”, $3,499/1 year (2013-2014)
- Co-Principal Investigator – NSF, Award #1339981 -ROBERT NOYCE SCHOLARSHIP Program : Science, Technology, Engineering, and Mathematics for English Language Learners (STEMELL) $1,199,199 / 7 years, (2013-2020)

- Co-Principal Investigator - NSF -ROBERT NOYCE SCHOLARSHIP Program - Award # 0833317 Mathematics and Science Teacher Education Recruitment (MASTER) program at Lehman College, $870,462, 2009-2015.
- Senior personal for Teacher Education for Advanced Science Preparation (TEASP) program; New York State Education Department Math/Science Partnership Grant (2010-2013) - $3,163,620, 2010-2013
- Principal investigator -PSC-CUNY Award # 63268-00 41, “Study of the mechanism of the consolidation of the organic-inorganic melting gels”, $3,440, 2010-2011
- Principal investigator -PSC-CUNY Award # 60052-39 40 “Highly hydrophobic materials for hermetic barrier applications”, $3.125, 2009-2010
- Principal investigator GS-11, project 05 - DORMITORY AUTHORITY - STATE OF NEW YORK – “Monodisperse nano-particles for drug delivery”, $140,000, 2010-2011
- Liaison between Department of Chemistry and Title V – NSF program in charge with a budget of $75,000 for new equipment for the general chemistry laboratory

PUBLICATIONS

Peer-reviewed Publications (Summary: 79 peer-reviewed journal papers, 19 papers published in conference proceedings, 3 book chapters, 2 editor of a book and 2 editorials.)

1. M. Aparicio, J. Mossa, G. Rodriguez, J. Guzman, Q. Picard, L.C. Klein, A. Jitianu, submitted “Consolidated Melting-Gel Coatings on AZ31 Magnesium Alloy with Excellent Corrosion Resistance in NaCl solutions–An Interface study” ACS Applied Materials & Interfaces, 11, 2019, 3493-3505, DOI: 10.1021/acsami.8b20199
2. V.H Fragal, E.H Fragal, T. Zhang, X. Huang, T.S.P. Cellet, G.M. Pereira, A. Jitianu, A.F Rubira, R. Silva, T. Asefa,” Deriving Efficient Porous Heteroatom-Doped Carbon Electrocatalysts for Hydrazine Oxidation from Transition Metal Ions-Coordinated Casein”, Advanced Functional Materials, 2019, 180486 (1-12).
3. L. C. Klein, S. Kallontzi, L. Fabris, A. Jitianu, C. Ryan, M. Aparicio, L. Lei and J. P. Singer, “Applications of melting gels” J. Sol-Gel Science & Technology, 89, 2019, 66-77
4. N.A. O'Connor, L. S. Einbond, S. Redenti, M. Sauane, A. Jitianu, “Self-degradable curcumin polymer with anti-cancer activity” J. Applied Polymer Science 135, 2018, 46867, DOI: 10.1002/app.46867
5. Q. Picard, G. Akalonu, J. Mercado J. Mosa, M. Aparicio, L. C. Klein, A. Jitianu, “Electrodeposition of hybrid sol-gel glass coatings on 304 stainless steel for corrosion protection”, Ceramic Transactions 265, 2018, 205-220
6. L. Lei, D.A. Kovacevich, M.P. Nitzsche, J. Ryu, Kutaiba Al-Marzoki, G. Rodriguez, Lisa C. Klein, A. Jitianu , Jonathan P. Singer, Obtaining Thickness-Limited Electrospray Deposition for 3D Coating” ACS Applied Materials & Interfaces 10, 2018, 11175-11188, DOI: 10.1021/acsami.7b19812
7. N.A O'Connor, M. Jitianu, G. Nunez, Q. Picard, M. Wong, D. Akpatsu, A. Negrin, R. Gharbaran, D. Lugo, S. Shaker, A. Jitanu, S. Redenti, “Dextran hydrogels by crosslinking with amino acid diamines and their viscoelastic properties”, International journal of biological macromolecules, 111, 2018, 370-378.

8. L.C. Klein, K. Al-Marzoki, A. Jitianu, “Phase separation in melting gels”, European Journal of Glass Science and Technology Part B Physics and Chemistry of Glasses, 58, 2017, 142-149
9. A. Jitianu, S. Cadars, F. Zhang, G. Rodriguez, Q. Picard, M. Aparicio, J. Mosa, L.C. Klein “29Si NMR and SAXS investigation of the hybrid organic-inorganic glasses obtained by consolidation of the melting gels”, Dalton Transaction 46, 2017, 3729-3741
10. M. Aparicio, A. Jitianu, G. Rodriguez, K. Al-Marzoki, J. Mosa, L. C. Klein, “Thickness-properties synergy in organic–inorganic consolidated melting-gel coatings for protection of 304 stainless steel in NaCl solutions”, Surface and Coatings Technology, 315, 2017, 426–435, doi.org/10.1016/j.surfcoat.2017.02.059
11. L. C. Klein, A. Degnah, K. Al-Marzoki, G. Rodriguez, A. Jitianu, J. Mosa, and M. Aparicio, “Electrochemical Properties of Melting Gel Coatings”, Ceramic Transactions, 260, 2016, 235-243
12. J. Gabriel, A. Patel, E. Ebenezer, A. Jitianu, and M. Jitianu, “Investigation of Pyroaurite-Type Anionic Clay-Derived Mixed Oxides with Various Compositions”, Ceramic Transactions, 259, 2016, 17-30
13. M Aparicio, A Jitianu, G Rodriguez, A Degnah, K Al-Marzoki, J Mosa, L C Klein “Corrosion Protection of 304 Stainless Steel with Melting Gels Coatings”, Electrochimica Acta 2016, 202, 325-332 DOI: 10.1016/j.electacta.2015.12.142
14. A. Jitianu, G. Gonzalez, L.C. Klein, “Hybrid Sol–Gel Glasses with Glass-Transition Temperatures below Room Temperature” Journal of American Ceramic Society, 2015, 98, 3673-3679, DOI: 10.1111/jace.13798
15. L. Predoana, A. Jitianu, M. Voicescu, N. G. Apostol, M. Zaharescu, “Study of formation of LiCoO2 using a modified Pechini aqueous sol-gel process”, Journal of the Sol-Gel Science and Technology, 74, 2015, 406-418
16. L. Predoana, A Jitianu, S. Preda, B. Malic, M. Zaharescu, “Thermal behavior of Li-Co-citric acid water based gels as precursors for LiCoO2 powders”, Journal of Thermal Analysis and Calorimetry, 119, 2015, 145-153, DOI 10.1007/s10973-014-4178-4
17. A. Muraca, N. O’Connor, R. Kaur-Bhatia, N. Apostol, A. Jitianu, M. Jitianu, „Titanium dioxide nanocomposites – synthesis and photocatalysis”, Ceramic Transactions, 249, 2014, 123-135
18. A. Jitianu, and L.C. Klein, “Encapsulating Battery Components with Melting Gels”, Ceramic Transactions, 250, 2014, 279-286.
19. L. C. Klein , B. McClarren, and A. Jitianu, “Silica-Containing Hybrid Nanocomposite “Melting Gels”, Materials Science Forum, 783-786, 2014, 1432-1437.
20. M. Jitianu, A. Jitianu, M. Stamper, D. Aboagye, L. C. Klein, “Melting Gel Films for Low Temperature Seals”, Materials Research Society Proceedings, 1547, 2013, 81-86, DOI. http://dx.doi.org/10.1557/opl.2013.506
21. M. Jitianu, DC. Gunness, DE. Aboagye, M. Zaharescu, A. Jitianu, “Nanosized Ni-Al layered double hydroxides - Structural characterization”, Materials Research Bulletin, (48), 2013, 1864-1873
22. L.Gambino, A. Jitianu, L.C. Klein, “Dielectric behavior of organically modified siloxane melting gels” Journal Of Non-Crystaline Solids (24), 2012, 3501-3504
23. L. C. Klein and A. Jitianu, “Synthesis of Melting Gels using monosubstituted and Di-Substituted Alkoxysilanes“, Material Matters, 7(2), 2012, 8-12

24. A. Jitianu, K. Lammers, G.A. Arbuckle-Kiel, L.C. Klein “Thermal analysis of organically modified siloxane melting gels”, Journal of Thermal Analysis and Calorimetry, 107, 2012, 2039-2045
25. L. Predoana, A. Jitianu, B. Malic, M. Zaharescu, “Study of the gelling process in the La-Co-citric acid system”, Journal of American Ceramic Society, 95 (3), 2012, 1068-1076
26. L.C. Klein, A. Jitianu, “Organic-Inorganic Hybrid Melting Gels”, Journal of the Sol-Gel Science and Technology, 59, 2011, 424-431
27. Yu-Ho Won, D. Aboagye, Ho S. Jang, A. Jitianu, L.A. Stanciu,“Core/Shell Nanoparticles as Hybrid Platforms for the Fabrication of a Hydrogen Peroxide Biosensor”, Journal of Material Chemistry, 20, 2010, 5030-5034
28. A. Jitianu, J.P. Doyle, G. Ammatuci, Lisa C. Klein, “Methyl modified siloxane melting gels for hydrophobic films”, J. Sol-Gel Sci. Technol. 53, 2010, 272-279.
29. A. Jitianu, M.-S. Kim, D. Andreescu, and D.V. Goia, “A simple preparative route to highly stable dispersions of uniform silver nanoparticles”, Journal of Nanoscience & Nanotechnology – 9 (3), 2009, 1891-1896.
30. A. Jitianu, G. Amatucci, Lisa Klein, Phenyl-Substituted Siloxane Hybrid Gels that Soften below 140oC, Journal of the American Ceramic Society – 92 (1), 2009, 36-40.
31. A. Jitianu, G. Amatucci and L.C. Klein, “Organic-inorganic Sol-Gel Thick Films for Humidity Barriers”, Journal of Materials Research – 23(8), 2008, 2084-2090.
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45. L.A. Stanciu; J.R. Groza; A. Jitianu; M. Zaharescu. “Structural Evolution during Reaction to Form Aluminum Titanate from Sol-Gel Precursors”, Materials and Manufacturing Processes 19, 2004, 641-650.
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EDITORIALS:

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BOOKS:

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“Handbook of Sol-Gel Science and Technology; Processing Characterization and Applications,
Springer New York, Second edition – June 2018
2. M. Apparicio, A. Jitianu, L.C. Klein
“Sol-Gel Processing for Conventional and Alternative Energy”
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BOOK CHAPTERS:

1. “Sol-Gel Processing for Conventional and Alternative Energy”, “Sol-Gel Packaging for Electrochemical Devices” by A. Jitianu, L. Gambino and L.C. Klein, Edited by M. Apparicio, A. Jitianu, L.C. Klein, Springer, New York, 2012
2. “Hybrid nanocomposites for Nanotechnology: Electronic, Optical, Magnetic and Bio/Medical Applications”, “Sol-Gel Hybrids for Electronic Applications: Hermetic Coatings for Microelectronics, and Energy Storage”, by A. Jitianu, and L.C. Klein , ed. L. Merhari, Springer, New York 2009, p. 429-455
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Selected Papers published in Proceedings and presented at Conferences and Scientific Meetings

1. T. Ma, J. Guzman-Pichardo, L.C. Klein, A. Jitianu, J.P. Singer, “Focused laser spike (FLaSk) thermocapillary patterning of micro/nanostructures”, Proceedings Volume 10905, Laser Applications in Microelectronic and Optoelectronic Manufacturing (LAMOM) XXIV; 1090514, 2019, https://doi.org/10.1117/12.2507662
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5. A. Barau, A. Jitianu, M. Crisan, D. Crisan, N. Dragan, M. Zaharescu, “Structural characterization of TiO2 based films prepared by sol-gel method”, 13th International Workshop on Sol-Gel Science and Technology”, University of California, LA, August 21-26, 2005, p.301-303
6. M. Raileanu, M. Giubelan, M. Zaharescu, A. Jitianu, I. Peleanu, and A. Meghea, “Effect of precursors and ultrasounds on the properties of some C60-doped sol-gel silica materials”, Proceedings of the "The XI International Materials Research Congress", Cancun, Mexico, August 25-29, 2002, Edited by: T.M. Lopez, D. Avnir, and M. Aegerter. Kluwer Academic Publishers, 2003, Included in: “Emerging Fields in Sol-Gel Science and Technology", pag. 165
7. M. Zaharescu, V. Badescu, A. Vasilescu and A. Jitianu, “Contribution to the sol-gel chemistry in silica based systems”, Proceedings of the "The XI International Materials Research Congress", Cancun, Mexico, August 25-29, 2002, Edited by: T.M. Lopez, D. Avnir, and M. Aegerter. Kluwer Academic Publishers, 2003, Included in: “Emerging Fields in Sol-Gel Science and Technology", pag. 157

8. M. Crisan, A. Jitianu, M. Zaharescu, F. Mizukami, S. Niwa, L. Stanciu, J. Groza "Oxide nano-powders obtained by sol-gel method" in, Nanoscience@Nanotechnology, 3 eds. E.Balabanova, I.Dragieva, Heron Press, Sofia, 2003, p.48-51
9. Y. Altindag, A. Jitianu and M. Wark, "SnO2 nanoparticles in the pores of non-structured SiO2 and of Si-MCM-41:Comparison of their properties in gas sensing" Proceedings of the 3rd International Symposium and Nanoporous Materials, Ottawa, Ontario, Canada, June 12-15, 2002, Edited by: A. Sayari, Dept. of Chemistry, Ottawa, Ontario, K1N 6N5, Canada, and M. Jaroniec, Dept. of Chemistry, Kent State University, Kent, OH 44242, USA, Elsevier, Included in series Studies in Surface Science and Catalysis, Vol. 141 pag 653.
10. R. Bîrjega, R. Ganea, C. Nenu, G. Pop, A. Jitianu, "Al-MCM-41 Synthesis studies using Al-isopropoxide as Al source", Proceedings of the 3rd International Symposium and Nanoporous Materials, Ottawa, Ontario, Canada, June 12-15, 2002, Edited by: A. Sayari, Dept. of Chemistry, Ottawa, Ontario, K1N 6N5, Canada, and M. Jaroniec, Dept. of Chemistry, Kent State University, Kent, OH 44242, USA, Elsevier, Included in series Studies in Surface Science and Catalysis, Vol. 141 pag. 151
11. A. Jitianu, M. Crisan, M. Zaharescu, I. Rau, A. Meghea, "Structural and textural characterization of iron oxide nanoparticles in the Fe2O3-SiO2 system, obtained by sol-gel method" CAS 2001 PROCEEDINGS, vol. 1, 71-74 (2001)
12. I. Peleanu, M. Zaharescu, I. Rau, M. Crisan , A. Jitianu, A. Meghea "Nanocomposite materials for as (V) removal by magnetically intensified adsorption" ABSTRACTS OF PAPERS OF THE AMERICAN CHEMICAL SOCIETY 221: 32-IEC Part 1 APR 1 2001
13. A. Szatvanyi, M. Crisan, D. Crisan, A. Jitianu, M. Zaharescu, "LiCoO2- based materials prepared by sol-gel method", Proceedings of the Second European Conference and Exhibition on Advanced Materials and Technologies Euro-TECHMAT, 9-13 September 2001, Bucharest, Romania
14. J. Groza, V.Kodash, M. Crisan, A. Jitianu, M. Zaharescu, "FAST Sintering of Nano-Sized Sol-Gel Oxide Powders" (Invited lecture) Powder Metallurgy Science and Technology (Proceedings of Second International Conference on Powder Metallurgy RoPM'2000), Ed. G.Arghir, U.T.Pres, Cluj-Napoca, vol.1, 27-32, (2000)
15. A. Jitianu, M. Zaharescu, V. Badescu, A. Britchi and C. Deleanu, "Sol-gel Reactions of substituted Si-alkoxides. NMR, GS-MS and IR comparative studies Proceedings at 13th Conference on Glass and Ceramics, Edited by B. Samuneva, E. Bachavarov, I. Gutzov, Y. Dimitriev, Publishing House "Science Invest", 1999, p 173-180.
16. M. Crisan, M. Zaharescu, M. Preda, A. Jitianu, D. Crisan, "Sol-Gel Nano-sized oxide powders in Al2O3-TiO2-SiO2 system", Proceeding of 13th Conference on Glass and Ceramics, Varna, Publishing House, Science Invest, Sofia 1999, Eds. B. Samuneva, S. Bachvarov, I. Gutzov, Y. Dimitriev, Vol.2, Ceramics, p. 136-141.
17. M. Jitianu, M. Zaharescu, A. Jitianu, Al. Ivanov, D. Crisan, R. Marchidan, "Spectroscopic studies on MO-M2O3 oxidic forms", Proceeding of 13thConference on Glass and Ceramics, Varna, Publishing House, Science Invest, Sofia 1999, Eds. B. Samuneva, S. Bachvarov, I. Gutzov, Y. Dimitriev, Vol.2, Ceramics, p.66-71.

18. M. Preda, M. Crisan, D. Crisan, A. Jitianu and M. Crisan, "Tialite based ceramics in the pseudo ternary system MgO.Al2O3 - Al2O3. TiO2 – 3 Al2O3.2SiO2 British Ceramic Proceedings No. 60 Vol. 2, pp. 233-234 (Extended Abstract).
19. M. Zaharescu, M. Preda, M. Crisan, D. Crisan, E. Vasile, A. Jitianu, "Mono- and poly- component nano-sized oxide powders obtained by sol-gel method", Adv. Sci. Technol, 1, Cermics: Getting into the 2000's, (Proc. of the World Ceramics Congress, 9th CIMTEC), Part B, Edited by P. Vincenzini, Techna, Faenza, 1999, p. 89-96.
20. M. Zaharescu, A. Jitianu, V. Badescu, M. Radu, "Comparative Study of the Sol-gel transition mechanism of different substituted Si-alkoxides", Adv. Sci. Technol, 1, Cermics: Getting into the 2000's, (Proc. of the World Ceramics Congress, 9th CIMTEC), Part C, Edited by P. Vincenzini, Techna, Faenza, 1999, p. 151-158.

CURRICULUM VITAE

Gustavo Lopez, Professor

EDUCATION

1991-1992	:	Postdoctoral Associate – Advisor: David L. Freeman, University of Rhode Island.
1986-1991	:	Ph.D. Physical Chemistry – Advisor: Paul E. Cade, University of Massachusetts, at Amherst.
1985-1986	:	No degree - University of Puerto Rico, at Río Piedras.
1980-1984	:	B.S. Chemistry – University of Puerto Rico, at Humacao.

CAREER DETAILS

2010-to present	:	Professor - Department of Chemistry – Lehman College
2010-to present		Professor – Chemistry Graduate Program – CUNY Graduate Center
Summer 2010	:	Visiting Professor- Division of Health Sciences and Technology, MIT
2001-to 2010	:	Professor - Department of Chemistry – University of Puerto Rico, at Mayagüez
Summer 2009	:	Visiting Professor – Center for Renewable Energy Science and Technology - University of Massachusetts, Amherst
1996-to 2001	:	Associate Professor - Department of Chemistry - University of Puerto Rico, at Mayagüez.
1999- 2000	:	Acting Dean of Academic Affairs and Research for the Faculty of Arts and Sciences, University of Puerto Rico, at Mayagüez.
1993-1996	:	Assistant Professor - Department of Chemistry - University of Puerto Rico, at Mayagüez.
1992-1993	:	Assistant Professor - Department of Chemistry - InterAmerican University of Puerto Rico, at Hato Rey.
Summer 1992	:	Visiting Scientist - University of Puerto Rico, at Río Piedras.
1986-1991	:	Teacher Assistant - UMASS, at Amherst.

AWARDS

1. Magna Cum Laude - B.S. in Chemistry.
2. 1994-95 - Research Careers for Minority Scholars (RCMS) Fellowship, (with Yanira Rivera).

3. 1994 Undergraduate Student Summer Research Fellowship in Science and Mathematics, Council of Undergraduate Research, (with Ingrid Quintana).
4. 1997-2002 - Henry and Camille Dreyfus Award.
5. 1997, 1999 - Scholarly Productivity Award (SPA).
6. 2000 - Sigma Xi nominated member.
7. 2000 – University of Puerto Rico – Central Administration Recognition for Outstanding Researcher.
8. 1997, 2002, 2004, 2009 – Who's who among America teachers?

MEMBERSHIPS

American Chemical Society
American Physical Society
Biophysical Society
Sigma Xi Research Society

TEACHING

CHE 114 – Essentials of General Chemistry
CHE 121 – Essentials of Organic Chemistry Laboratory
CHE 167 – General Chemistry Laboratory I
CHE 168 – General Chemistry Laboratory II
CHE 246 – Quantitative Analysis
CHE 342 – Physical Chemistry Course in Quantum Chemistry
CHE 344 – Physical Chemistry Course in Kinetics and Thermodynamics
CHE 450 – Chemistry Seminar
CHE 391 – Chemical Investigation
CHE 491 – Chemical Research
CHE 462 – Studies in Physical Chemistry

RESEARCH

Our research group has used and developed computational techniques to study the physical properties of systems in condensed phase. Some of the systems that have been considered are metallic, atomic and molecular nanoclusters, dissociation processes on surfaces and clusters, confined polymers, proteins, and surfactants. In the past year, we have started to apply computational techniques to study the equilibrium (for liquids) and non-equilibrium (glasses) properties.

RESEARCH FUNDING

1993-1994	:	SEED MONEY UPR-Mayagüez - $4,000
1994-1995	:	NSF-MRI - $12,000
1994-1996	:	Research Corporation - $40,000
1994-1998	:	NSF-RIMI (Associate Investigator) - $495,000
1995-1996	:	R&D SEED MONEY UPR-Mayagüez - $6,000
1996-1998	:	Research Corporation - $25,000
1996-2001	:	NSF-EPSCoR - $100,000
1997-2002	:	Henry and Camille Dreyfus Foundation - $60,000
2000-2001	:	NASA Space Grant - $45,000
2001-2006	:	NIH-COBRE Program - $10,000,000 – (Associate Investigator)
2002-2006	:	NIH-SCORE - $1,000,000 (co-PI)
2004-2008	:	NIH-INBRE - $1,000,000 (Associate Investigator)

2006-2010 : NIH-SCORE - $600,000
2009-2014 : NIH-INBRE - $500,000 (Associate Investigator)
2013-2016 : NSF-NOYCE - $250,000 (co-PI)
2016-2021 : NSF-CREST - $5,000,000 (co-PI)
2018-2023 : NIH-RISE - $1,200,000
2018-2023 : NSF-LSAMP - $4,500,000 (co-PI)

PUBLICATIONS

1. *Gibbs free energies for formation of argon clusters adsorbed on graphite*, Strozak, M.A.; López, G.E.; Freeman, D.L. J. Chem. Phys. **1992**, 9**7**, 4445.
2. *Study of the heat capacity anomalies in bimetallic clusters using J-walking Monte Carlo methods*, López, G.E.; Freeman, D.L. J. Chem. Phys. **1993**, 98, 1428.
3. *The electronic structure of weakly bound systems: I. Rare gas bimolecular cations*, López, G.E. J. Comp. Chem. **1995**, 16, 758.
4. *The electronic structure of weakly bound systems: II. $(NeX)^+$ and $(ArX)^+$ (X = H_2O, HCl, HF) bimolecular cations*, López, G.E. J. Comp. Chem. **1995**, 16, 768.
5. *Monte Carlo studies of heat capacity anomalies in two-dimensional nanoclusters*, Rivera, Y.; Weber, D.C.; López, G.E. J. Chem. Phys. **1995**, 103, 10627.
6. *The dynamics of matrix trapping: I. Deposition of a pure argon matrix*, Cruz, A.J.; López, G.E. J. Chem. Phys. **1996**, 104, 4294.
7. *The dynamics of matrix trapping: II. Simple spherical species trapped in a rare gas matrix*, Cruz, A.J.; López, G.E. J. Chem. Phys. **1996**, 104, 4301.
8. *Study of the solid-liquid transition in Ar_{55} using the J-walking Monte Carlo method*, López, G.E., J. Chem. Phys. **1996**, 104, 6650.
9. *Exploring the variation in the structure of 13-atom alloy clusters as a function of atom size and interaction energies*, Nieves, M; Quintana, I; López, G.E. Microchem. J. **1997**, 55, 254.
10. *Phase transitions in molecular clusters*, Acevedo, A.J.; Caballero, L.M.; López, G.E., J. Chem. Phys. **1997**, 106, 7257.
11. *Structure and thermodynamics of molecular nitrogen clusters*, Rodriguez, I.; Acevedo, A.J.; López. G. E., Mol. Phys. **1997**, 90, 943.
12. *Quantum dissociation dynamics of H_2 and D_2 on a Ni_{13} cluster*, Álvarez, Y.L.; López, G.E.; Cruz, A.J., J. Chem. Phys. **1997**,107, 1420.
13. *Determination of the structure and stability of water clusters using temperature dependent techniques*, Quintana, I.M.; Ortiz, W.; López, G.E., Chem. Phys. Lett. **1998**, 282, 429.
14. *Classical Monte Carlo study of phase transitions in rare gas clusters adsorbed on model surfaces,* Matos Y.N.; López, G.E., J. Chem. Phys. **1998,** 109, 1141.
15. *Extending the J-walking Monte Carlo algorithm to the isothermal-isobaric ensemble: Solid-liquid equilibrium in clusters,* Ortiz, W.; Perlloni, A.; López, G.E., Chem. Phys. Lett. **1998**, 298, 66.
16. *Computation of adsorption isotherms for benzene, toluene, and p-*xylene *in heulandite zeolite*, Laboy, M.; Santiago, I; López, G.E., Ind. & Eng. Chemistry Research **1999**, 38, 4938.
17. *Density functional studies of cation-water complexes,* Vicens, M.C.; López, G.E., J. Comp. Chem. **2000**, 21, 63.
18. *Phase transitions of alloy clusters adsorbed on model surfaces,* Ocasio, M.; López, G.E., J. Chem. Phys. **2000**, 112, 3339.
19. *Applying the J-walking algorithm to distribution function theory: Adsorption isotherms for atomic monolayers*, Nadal, L.; López, G.E., Mol. Phys. **2000**, 98, 905.

20. *Computational study of order-disorder transitions in alloy clusters using the isothermal-isobaric ensemble*, Vicens, M.C.; López, G.E., Phys Rev. A **2000**, 62, 33203.
21. *Efficient algorithm in the gran canonical ensemble: Constructing adsorption isotherms,* Boodoosing, G.L.; López, G.E., Mol. Simulations **2002**, 28, 273.
22. *Fourier path-integral Monte Carlo study of a two-dimensional model quantum monolayer*, Ortiz, V.; López, G.E., Mol. Phys. **2002**, 100, 1003.
23. *Solid-liquid phase diagrams the water octamer*, Ocasio, M.; López, G.E., Chem. Phys. Lett. **2002**, 356, 168.
24. *Quantum effects in the phase diagram of Ne_{13} and para-$(H_2)_{13}$.* López, G.E., J. Chem. Phys. **2002**, 117, 2225.
25. *Parallel tempering-cavity bias algorithm in the Gibbs ensemble*; Ortiz, V.; Maury-Evertsz J.; López, G.E., Chem. Phys. Lett. **2003**, 358, 131.
26. *Exploring repulsive interactions in a model helical peptide: A parallel tempering Monte Carlo study*; Ocasio, M.; Maury-Evertsz J.R.; Pastrana-Ríos, B.; López, G.E., J. Chem. Phys. **2003**, 119, 9274
27. *Fourier path integral Monte Carlo in the grand canonical ensemble,* López, G.E., J. Chem. Phys. **2003**, 119, 9274.
28. *Equilibrium properties of confined single-chain homopolymers,* Maury-Evertsz J.R; Estevéz, L.A., López, G.E., J. Chem. Phys. **2003,** 119, 9925
29. *Effects of branching and confinement on star-branched polymeric systems,* Maury-Evertsz J.R; Estevéz, L.A.; López, G.E., J. Chem. Phys. **2004,** 121, 8652.
30. *Thermodynamics of the liquid states of surfactant,* Villalobos, L.; López-Álvarez Y.; López, G.E., J. Chem. Phys. **2005**, 122, 10422.
31. *Critical behavior and capillarity condensation of methane in carbon nanotubes,* Ortiz, V.; López-Álvarez Y.; López, G.E., Mol. Phys. **2005,** 105, 2587.
32. *Studies on the behavior of nanoconfined homopolymers with cyclic chain architecture,* Maury-Evertsz J.R; López, G.E., J. Chem. Phys. **2005,** 123, 321.
33. *Molecular dynamics of surfactant protein C (SP-C): From single molecule to heptameric aggregates,* Ramirez, E.; Santana, A.; Cruz, A.; López, G.E., Biophys. J. **2006**, 90, 2698.
34. *Electrochemistry and [60]fullerene displacement reactions of (dihapto-[60]fullerene) pentacarbonyl metal(0) (M = Cr, Mo, W),* Igartúa-Nieves E.; Ocasio-Delgado, Y.; Torres-Castillo, M.D.L.A; Rivera-Betancourt, O.; Rivera-Pagán, J.A.; Rodriguez, D.; López, G.E.; Cortés-Figueroa, J.E., Dalton Trans. **2007**, 102, 1293.
35. *Liquid-liquid equilibrium in model surfactant,* Ramirez, E.; Santana, A; Cruz, A.; López, G.E., J. Chem. Phys. **2007** 127, 224705.
36. *Isotopic effect in the solid-liquid line of quantum clusters,* Ramirez, E.; Lopez, G.E., Mol. Phys. **2007** 105, 2399.
37. *Study of magnesium diboride clusters using hybrid density functional theory*, Ramirez, E.; Santana, A.; Cruz, A.; López, G.E., Research Lett. in Phys. **2008**,Volume 2008, Article ID 879017, 4 pages doi:10.1155/2008/879017.
38. *Effects of active site mutations in Hemoglobin I from Lucina pectinata: A molecular dynamic study*, Ramírez, E.; Cruz, A.; Uchima, L.; Santana, A.; López-Garriga, J.; López, G.E., Molecular Simulations **2008**, 34, 715.
39. *Computational model for the peptide-free conformation of class iI MHC proteins*, Painter, C.; Cruz, A.; López, G.E.; Stern, L.J.; Zabala-Ruiz, Z., PLoS One **2008**, 3 (6):e2403 18545669.

40. *Molecular dynamic study dynamics of subtilisin Carlsberg in aqueous and nonqueous solvents,* Cruz, A.; Ramirez, E.; Santana, A.; Barletta, G.; López, G.E., Molecular Simulations **2009**, 35, 205.
41. *Formation of an iron oxide bond in metal oxide nanoparticle: A Density Functional Theory study,* López-Cruz, A.; López G.E., Mol. Phys. **2009**, 107, 1799.
42. *Surface Aided Replica Exchange Monte Carlo Algorithm: Application to the prewetting transition*, Nieves, S.; López, G.E., Mol. Phys. **2010**, 108, 1539.
43. *Bimetallic finite systems: Structure and thermodynamics of bimetallic nanostructures in two and three dimensions*, Nieves, S.; Mo, E.; López, G.E., Mater. Chem. and Phys. **2011**, 129, 580.
44. *Using a reduced dimensionality model to compute the thermodynamic properties of dimeric polypeptides systems aggregates,* López, G.E.; Cruz, A.; Sepulveda-Chernovy, M.; Torres-Lugo, M.; López-Garriga, J., J. Biol. Phys. **2012**, 38, 383.
45. *Quantum thermodynamics of $(H_2)_x@C_{60}$ [x=1-2]: A path integral Monte Carlo study*, Cruz, A.; López, G.E., Phys. Lett. A **2012**, 376, 1584.
46. *Modeling non-aqueous proton wires tethered to helical-peptides: Biased proton transfer driven by helical dipoles*, López, G.E., Colón, I.; Cruz, A.; Ghosh, S.; Nicholls S.B.; Viswanathan, U.; Auerbach, S.M.; Hardy, J.A., J. Phys. Chem. A **2012**, 116, 1283.
47. *Src activation by b-adrenoreceptors is a key switch for tumour metastasis*, Armaiz-Pena, G.N.; Allen, J.K.; Cruz, Anthony; Villares, G.J.; Cruz, A.; Stone, R.L.; Nick, A.M.; Lin, Y.G.; Han, L.Y.; Mangala, L.S.; Villares, G.J.; Vivas-Mejias, P.; Rodriguez-Aguayo, C.; Nagaraja, A.S.; Gharpure, K.M.; Wu, Z.; English, R.D.; Soman, K.V.; Shazhad, M.M.K.; Zigler, M.; Deavers, M.T.; Zien, A.; Soldatos, T.G.; Jackson, D.B.; Wiktorowicz, J.E.; Torres-Lugo, M.; Young, T.; Geest, K.D.; Gallick, G.E.; Bar-Eli, M.; López-Berestein, G.; Cole, S.W.; López, G.E.; Lutgendorf, S.K.; Sood, A.K., Nature Comm. **2013**, 4, 1403.
48. *Effect of surface corrugation on low temperature phases of adsorbed $(p\text{-}H_2)_7$: A quantum path integral Monte Carlo study,* Cruz, A.; López, G.E., Phys. Lett. A **2014**, 378, 1375.
49. *The gamma-butyrolactone receptors BulR1 and BulR2 of Streptomyces tsukubaensis: tacrolimus (FK506) and butyrolactone synthetases production control,* Salehi-Najafabadi, Z.; Barreiro, C; Rodriguez-Garcia, A.; Cruz, A.; López, G.E.; Marin, J.F., Appl. Microbiol. Biotechnol. **2014**, 98, 4919.
50. *Quinoline-2-thiol derivatives as fluorescent sensors for petals, pH, and HNO*, O'Connor, N.A.; López, G.E.; Cruz, A., Curr. Chem. Lett. **2014**, 3, 189.
51. *Structural and functional characterization of Interleukin-24 based on atomistic molecular modeling*, Cruz A.; Sauane, M.; López, G.E., Chem. Lett. **2016**, 45, 327.
52. *Stability of molecular hydrogen inside C_{720} fullerene: A path integral Monte Carlo study,* B. Nguyen, A. Cruz, D. McGregor, and G.E. Lopez, Phys. Lett. A **2016**, 381, 298.
53. *Probing the limits of supramolecular G-Quadruplexes using atomistic molecular dynamics simulations,* Garcia-Arriaga, M; Acosta-Santiago M.; Cruz A.; Rivera-Rivera, J.M.; López, G.E.; Rivera, J.M., Inor. Chimica Acta **2017,** 468, 209.
54. *Nuclear quantum effects on the liquid-liquid phase transition of a water-like monoatomic liquid.* Nguyen, B.; López, G.E.; Giovambattista, *N.* Phys. Chem. Chem. Phys. ***2018****,* 20, 8210*.*
55. *The electronic structures of Nickel-Palladium alloy clusters: A density functional theory study,* Frank, H; Joseph, W; McGregor, D.; López, G.E., Chem. Letters **2018**, 47, 458.
56. *Identification of atomic defects in hexagonal boron nitride via X-ray photoelectron spectroscopy and first principle calculations,* Lopez-Morales, G.; Proscia, N.V.; López, G.E.; Meriles, C.A.;

Menon, V.M., Appl. Phys**. 2018** (submitted).

57. *Study of magnetization of doped two-dimensional materials using the Ising model,* Kugelmas, S.; López-Morales, G.; Cruz, A.; McGregor, D.; López, G.E., Appl. Phys. Lett. **2018** (submitted).
58. *Synthesis and characterization of TBA_4 [$Tc^{X}M$-$PW_{11}O_{39}$] where M=O, N; Comparing Tc^{V} and Tc^{VI} in metal oxides matrices,* Dembowski, M.; Lukens, W.W.; Cruz, A.; Althour, A.; Burton-Pye, B.P.; López, G.E.; McGregor, D.; Francesconi, L.C., Appl. Phys. Lett. **2019** (in preparation).
59. *Potential energy landscape formalism for quantum liquids,* López, G.E.; Giovambattista, N., Nature Physics **2019** (in preparation).

CURRICULUM VITAE

Prabodhika Mallikaratchy
Assistant Professor, Department of Chemistry, Lehman College

EDUCATION

2008-2012 Postdoctoral Fellow, Memorial Sloan Kettering Cancer Center
2003-2008 PhD Chemistry, University of Florida
2001-2003 MS Chemistry, University of Louisiana, Monroe
1995-1999 G.I.Chem (BS), Institute of Chemistry, Sri Lanka

CAREER DETAILS

2012-To date Assistant Professor
2012-2018 Visiting Investigator, Memorial Sloan Kettering Center
2005-2008 Graduate Research Assistant, Department of Chemistry, University of Florida
2003-2005 Teaching Assistant, Department of Chemistry, University of Florida
2001-2003 Teaching Assistant, Department of Chemistry, University of Louisiana, Monroe

AWARDS

2017 Junior Faculty Research Award in Science and Engineering, Runner-up
2010-12 Lymphoma Research Foundation Research Fellow award
2009-10 Lauri Strauss Leukemia Research Fellow award: Principle Investigator
2008 Crow Stasch Award for excellence in publications, University of Florida
2007-08 Ruegamer Fellowship for best biochemistry student, University of Florida
2007 Procter & Gamble Award for excellence in graduate research, University of Florida
2000 Medal/Merit Pass honors pass; Institute of Chemistry, Sri Lanka
2000 Shireen Jayasuriya gold medal (1st place in class), Institute of Chemistry, Colombo, Sri Lanka
2000 Royal Society of Chemistry (Sri Lanka section) award for the best performance in Part II (Theory), Institute of Chemistry, Colombo, Sri Lanka
2000 W R O Fernando Prize for Physical chemistry, Institute of Chemistry, Colombo, Sri Lanka
1997 Merit Scholarship, Institute of Chemistry, Colombo, Sri Lanka

MEMBERSHIPS
American Chemical Society
New York Academy of Sciences
American Society of Gene & Cell Therapy
Oligonucleotide Therapeutic Society

TEACHING
CHE 244 Introductory Biochemistry Lecture
CHE 245 Introductory Biochemistry Lab
CHE 391 Chemical research
CHE491 Chemical research
CHE 449 Instrumental Analysis
BICM 71010 Advanced Biochemistry
BICM 72010 Basic Seminar in Biochemistry
CHE 248 Quantitative Chemical Analysis Lecture
CHE 249 Quantitative Chemical Analysis Lab

RESEARCH
Area 1) Implement variants of cell-SELEX methods to enable identification of functional nucleic acid aptamer ligands capable of recognizing cell-surface receptor proteins at their native state
Area 2) Engineer aptamers and multimeric scaffolds of multifunctional aptamers to enhance the affinity of aptamers and modulate molecular interactions in the immune system and in the nervous system
Area 3) Understand how folding influences the function of the aptamers via biophysical studies and structure-activity relationship (SAR) studies

RESEARCH FUNDING
1) START-UP 09/01/2012-05/25/2014
Lehman Funds $55,000
The Graduate Research Technology Initiative (GRTI) $55,623

2) NIH SC3 4185100 01/31/2013-01/31/2017
PI: Prabodhika Mallikaratchy
Direct and indirect amount: $437,400

3) Lauri Strauss Leukemia Foundation 09/01/2016-03/31/2017
PI: Prabodhika Mallikaratchy
Direct amount: $ 12,500.00

4) Junior Faculty Research Award in Science and Engineering, Sloan Foundation
PI: Prabodhika Mallikaratchy 05/2017-06/2018
Direct amount: $10,000

5) NSF CBET 40F68-02 01 07/01/2016-06/30/2019
Role: Key Person
Direct and indirect amount: $20,199.52

6) NIH SC1GM122648 04/01/2017-03/31/2021
PI: Prabodhika Mallikaratchy
Direct and indirect amount: 1,467,327.05

7) NIH NILHB T32 07/2017 - 06/2022
PIs: Jesus Angulo, Carla Boutin-Foster, Mary Charlson
Hunter-Weill T32 Trans-disciplinary Research Training Program
Role: Participant
Direct and indirect amount: $1,810,515.00

PUBLICATIONS (Dissertations, Peer-reviewed manuscripts, Patents, Conference proceedings and Book chapters)

42. Federica Moccia,Chiara Platella, Domenica Musumeci, Sana Batool, , Hasan Zumrut, John Bradshaw, Prabodhika Mallikaratchy*, Daniela Montesarchio* "The role of G- quadruplex structures of LIGS-generated aptamers R1. 2 and R1. 3 in IgM specific recognition" : Int J Biol Macromol. 2019 Apr 22; 133:839-849. doi: 10.1016/j.ijbiomac.2019.04.141; 2019.
41. US Patent application: 10/253,314, "Ligand-guided-selection method for screening antigen-specific ligands"
40. S Lingala, LU Nordstrøm, PR Mallikaratchy "Synthesis of stable azide and alkyne functionalized phosphoramidite nucleosides": Tetrahedron Letters, 2019 January 17; 60(3):211-213. doi:10.1016/j.tetlet.2018.12.018
39. Sana Batool, Kimon V Argyropoulos, Roksana Azad, Precious Okeoma, Hasan Zumrut, Sanam Bhandari, Rigzin Dekhang, Prabodhika Mallikaratchy* " Dimerization of an aptamer generated from Ligand-guided selection (LIGS) yields a high affinity scaffold against B-cells "Biochimica et Biophysica Acta (BBA)-General Subjects 1863 (1), 232- 240. doi: 10.1016/j.bbagen.2018.10.006. Epub 2018 Oct 17.
38. Federica Moccia, Domenica Musumeci, Chiara Platella, John Bradshaw, Prabodhika Mallikaratchy, Daniela Montesarchio. "Conformational behaviour and molecularity of novel anti-IgM G-quadruplex forming aptamers" 2018 August 19; 256th ACS National Meeting
37. Hasan Zumrut, Sana Batool, Kimon Argyropoulos, Rigzin Dekhang, Prabodhika Mallikaratchy. "Ligand-guided selection (LIGS): A SELEX variant to identify specific aptamers against cell-surface markers" 2018 August 19. 256th ACS National Meeting.
36. Sana Batool, Hasan Ekrem Zumrut, Sanam Bhandari, Nabeela Van, Shanell George, Prabodhika Mallikaratchy. "Design of a dimeric aptamer against B-cell receptor" 2018 March 18. 255th ACS National Meeting.
35. Sana Batool, Sanam Bhandari, Shanell George, Precious Okeoma, Nabeela Van, Hazan E. Zümrüt, and Prabodhika Mallikaratchy "Engineered Aptamers to Probe Molecular Interactions on the Cell Surface" Biomedicines. 2017 Aug 29;5(3). pii: E54. doi: 10.3390/biomedicines5030054.

34. Hazan E. Zümrüt, Sana Batool, Nabeela Van, Shanell George, Sanam Bhandari and Prabodhika Mallikaratchy Structural optimization of an aptamer generated from Ligand guided Selection (LIGS) resulted in high affinity variant toward mIgM expressed on Burkitt's lymphoma cell lines: Biochimica et Biophysica Acta (BBA)-General Subjects. 2017 July 01; 1861(7):1825-1832. pii: S0304-4165(17)30111-3. doi: 10.1016/j.bbagen.2017.03.020.

33. Hasan Ekrem Zumrut, Sana Batool, Nabeela Van, Prabodhika Mallikaratchy. "Optimization of structure of an aptamer discovered utilizing Ligand Guided Selection (LIGS) yields high affinity aptamer" 2017 April 2. 253rd ACS National Meeting.

32. US Patent Application: 14/727,509 David A Scheinberg, Prabodhika Mallikaratchy, Compositions and methods for treating cancer and other disease

31. George E Maio, Osita Enweronye, Hasan E Zumrut, Sana Batool, Nabeela A Van, Prabodhika R Mallikaratchy "Systematic Optimization and Modification of a DNA Aptamer with 2'-O-Methyl RNA Analogues" 2017 March 01; ChemistrySelect 2 (7), 2335-2340.

30. Mallikaratchy, P. "Evolution of Complex Target SELEX to Identify Aptamers against Mammalian Cell-Surface Antigens" Molecules. Jan 30;22(2). pii: E215. doi: 10.3390/molecules22020215.

29. Hasan Zümrüt, Naznin Ara, George Maio, Nabeela Van, Sana Battol and Prabodhika Mallikaratchy "Ligand-guided selection of aptamers against T-cell Receptor-cluster of differentiation 3 (TCR-CD3) expressed on Jurkat.E6 cells". Anal Biochem. 2016 November 01;512:1-7 doi: 10.1016/j.ab.2016.08.007.

28. George Maio, Hasan Zumrut, Nabeela Van, Sana Batool, Prabodhika Mallikaratchy. "Designing bispecific aptamers for increased stability in human serum" 2016 August 20. 252nd ACS National Meeting

27. Prabodhika Mallikaratchy. "Ligand-guided selection (LIGS): A screening technology to identify specific aptamers against cell-surface markers". 2016 August 20. 252nd ACS National Meeting

26. Hasan Zümrüt, Naznin Ara, Maria Fraile, George Maio, Prabodhika Mallikaratchy "Ligand-guided selection of target-specific aptamers: A screening technology for identifying specific aptamers against cell-surface proteins". Nucleic Acid Ther. 2016 Jun;26(3):190-8. doi: 10.1089/nat.2016.0611. Epub 2016 May 5.

25. Prabodhika Mallikaratchy, Hasan Zumrut, Naznin Ara "Discovery of Biomarkers Using Aptamers Evolved in Cell-SELEX Method", Aptamers selected by cell-SELEX for Theranostics" Principles, Eds. W. Tan and X. Fan, SpringerLink. 2015; p.265.

24. Prabodhika R. Mallikaratchy, Jeffrey R. Gardner, Lars Ulrik R. Nordstrøm, Nickolas J. Veomett, Michael R. McDevitt, Mark L. Heaney and David A. Scheinberg. "A self-assembling short oligonucleotide duplex suitable for pretargeting" Nucleic Acids Therapeutics, Volume: 23 Issue 4: July 31, 2013.

23. Prabodhika R. Mallikaratchy, Alessandro Ruggiero, Jeffrey R. Gardner, Vitaly Kuryavyi, William F. Maguire, Mark L. Heaney, Michael R. McDevitt, Dinshaw J. Patel and David A. Scheinberg. "A multivalent DNA aptamer specific for the B cell receptor on human lymphoma and leukemia" Nucleic Acids Res. 2011; 39(6): 2458.

22. Tang Z., Zhu Z., Mallikaratchy P., Yang R., Sefah K., Tan W. “Aptamer-target binding triggered molecular mediation of singlet oxygen generation” Chem. Asian J. 2010; 5 (4): 783.
21. Prabodhika Mallikaratchy, Alessandro Ruggiero, William Maguire, Kelly Piersanti, Jeffrey Gardner, Carlos Villa, Freddy Escorcia, Maria Lia Palomba, Mark Heaney, Michael R McDevitt, David A Scheinberg. “Multivalent DNA Aptamer-Based Therapeutic Agents for Lymphoma and Leukemia” Blood. 2009 November 20; 114(22);2711-2711
20. Prabodhika Mallikaratchy, David Scheinberg. “BIOT 288-Multivalent DNA aptamer- based therapeutic agents for lymphoma” 2009 August 16; 238th ACS National Meeting.
18. Hui William Chen, Youngmi Kim, Ling Meng, Prabodhika Mallikaratchy, Jennifer Martin, Zhiwen Tang, Dihua Shangguan, Meghan O’Donoghue, Weihong Tan. “Fluorescent Aptamer Sensors” Functional Nucleic Acids for Analytical Applications. 2009; 111-130
17. Prabodhika Mallikaratchy, Haipeng Liu, Yu Fen Huang, Hui Wang, Dalia Lopez-Colon, Weihong Tan. “Using aptamers evolved from cell-SELEX to engineer a molecular delivery platform” Chem. Commun., 2009, 3056-3058.
16. Zhiwen Tang, Prabodhika Mallikaratchy, Ronghua Yang, Youngmi Kim, Zhi Zhu, Hui Wang, Weihong Tan. “Aptamer switch probe based on intramolecular displacement” J. Am. Chem. Soc. 2008; 130 (34): 11268.
15. Mallikaratchy P. and Tang Z., Tan W. “Aptamers evolved from whole cell selection as a selective anti-tumor photodynamic agent”ChemMedChem. 2008; 3 (3): 425.
14. Dihua Shangguan, Zehui Cao, Ling Meng, Prabodhika Mallikaratchy, Kwame Sefah, Hui Wang, Ying Li, Weihong Tan. “Cell-specific aptamer probes for membrane protein elucidation in cancer cells” J. Proteomic Res. 2008; 7 (5): 2133.
13. Prabodhika Mallikaratchy, Zhiwen Tang, Weihong Tan. “Cell specific aptamer–photosensitizer conjugates as a molecular tool in photodynamic therapy” ChemMedChem: Chemistry Enabling Drug Discovery, 2008 March 14; 3(3), 425-428, doi: 10.1002/cmdc.200700260
12. Mallikaratchy P., Tang Z., Kwame S., Meng L., Shangguan D., and Tan W. “Aptamer directly evolved from live cells recognize membrane bound immunoglobin heavy mu chain on Burkitt’s lymphoma cells” Mol. Cell. Proteomics. 2007; 6 (12): 2230.
11. Prabodhika Mallikaratchy, Weihong Tan. “Selective antitumor aptamer-photodynamic agent conjugates as a tool in photochemo therapy” 2007 August 19; 234
10. Prabodhika Mallikaratchy. “In Vitro Selection and Development of Aptamers for Biomarker Discovery and Targeted Therapy” ProQuest: 2007
9. P Mallikaratchy, H Chen, Z Tang, L Meng, D Shangguan, P Parekh, Y Kim, K Sefah, W Tan. “DNA Aptamers for Molecular Imaging and Profiling of Cancer”, American Pharm. Rev. 2007; 10 (6): 134.
8. Tang, Z., Shangguan, D., Wang, K., Kwame, S., Mallikaratchy, P., Li, Y. and Tan, W. “Selection of aptamers for molecular recognition and characterization of cancer cells”. Anal. Chem. 79(13). 4900: 2007.

7. Shangguan, D., Tang, Z., Mallikaratchy P., Xiao, Z. and Tan W. “Optimizations and modifications of aptamers selected from live cancer cells” ChemBioChem 8(6). 603: 2007.
6. Dihua Shangguan, Ying Li, Zhiwen Tang, Zehui Charles Cao, Hui William Chen, Prabodhika Mallikaratchy, Kwame Sefah, Chaoyong James Yang, Weihong Tan. “Aptamers evolved from live cells as effective molecular probes for cancer study” Proc. of Natl. Acad. of Sci USA. 2006; 103: 11838.
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4. Tan, W., Cao, Z., Shangguan, D., Li, Y., Tang, Z., Mallikaratchy, P. and Chen, H.“Cancer cell proteomics using molecular aptamers”, Drug Discovery Handbook, Ed. Shayne Cox Gad, Wiley-Inter science, 2005; p. 73.
3. Mallikarachy P., Fronczek F. R., Brotherton H. O. and Junk T. “Facile Access to novel organotellurium heterocycles by nitration of Bis- (3, 5-Dimethylphenyl) Ditelluride” J. Het. Chem. 42(2). 243: 2005.
2 Prabodhika Mallikaratchy, Richard E Norman, Frank R Fronczek, Thomas Junk. “(μ- Diazenediyldiphenyl-κ2C2, N2: κ2C2′, N1) bis [(3, 5-dimethylphenyl) tellurium (II)]” Acta. Crystallographica. 2005; E61 (7): m1370.
1 Prabodhika Mallikaratchy, Richard E Norman, Frank R Fronczek, Thomas Junk. “Tribromo(3,5-dimethyl-2-nitrophenyl-κ2C1,O)tellurium(IV),-bromo(3,5-dimethyl-2- nitrophenyl-κ2C1,O)-tellurium-(II) and bromo(3,5-dimethyl-nitroso-phenyl- κ2 C1,O) tellurium(II)” Acta Crystallographica. 2003; C59: o571.

CURRICULUM VITAE

DONNA MCGREGOR

Assistant Professor, Department of Chemistry, Lehman College

EDUCATION

2009	PhD., Chemistry, The Graduate Center, CUNY
2007	MPhil., Analytical Chemistry, The Graduate Center, CUNY
2004	B.A (Biochemistry specialization), Hunter College, CUNY

CAREER DETAILS

2015 – Present	Assistant Professor of Chemistry	Lehman College, CUNY
2013 – 2015	Distinguished Lecturer in Chemistry	Hunter College, CUNY
2009 – 2013	Doctoral Lecturer in Chemistry	Hunter College, CUNY
2004 – 2009	Adjunct Lecturer in Chemistry	Hunter College, CUNY

AWARDS

2016	Online Learning Consortium Digital Learning Innovation Award
2011 & 2014	Outstanding Undergraduate Mentoring in the Sciences Award, Hunter College
2013	ACERT Faculty Fellow, Hunter College,
2013	Witten Award for Excellence in Teaching, Hunter College
2013	Faculty Innovations in Teaching with Technology Award, Hunter College
2012	Presidential Travel Award, Hunter College
2008	Gertrude Elion Scholarship (Graduate Student achievement), Hunter College
2005 & 2006	Rose K Rose Teaching Award for excellence in teaching, Hunter College

MEMBERSHIPS

American Chemical Society

TEACHING

CHE115	Essentials of General Chemistry Lab
CHE166	General Chemistry 1 Lecture
CHE167	General Chemistry 1 Lab
CHE168	General Chemistry 2 Lecture
CHE249	Quantitative Analysis Lecture
CHE450	Chemistry Department Seminar
CHE391	Chemical Investigations
CHE491	Chemical Research

RESEARCH

The self-assembly of amino acids and short peptide sequences to design alternative proton transfer materials: In this project, we are working collaboratively with the computational team of Professor Gustavo Lopez to understand how simple L and D-amino acids containing NH_x or COOH side chains self-assemble as either single amino acids or short peptide sequences. Specifically, we are looking to design alternative proton transfer materials to replace the nafion in fuel cells. In addition to the synthesis, self-assembly and characterization of these sequences we are also studying the proton transfer dynamics and computationally investigating the energy, stability and molecular level dynamics of the self-assembled constructs. The results from this project will help advance the development of more efficient fuel cells.

Using basic amino acids as building blocks to model metal-chelate structures: In this project, we design short D and L tripeptide sequences that act as metal-chelating cores to model and understand the binding of d-block metals. Specifically, we are looking at the metal rhenium and studying the peptide features that act to stabilize the Re-peptide constructs in an attempt to provide structural information for the intelligent design of radiotherapeutic drugs. In addition to the synthesis, characterization and experimental study of these constructs we are collaborating with Professor Gustavo Lopez to study the energy, stability and molecular level dynamics of these systems. The

results from this project will help advance the development of radiotherapeutic drugs for the treatment of cancer.

Using polyoxometalates as models to understand the oxidation state chemistry of the transition metals rhenium and technetium: In this project, we synthesize a variety of polyoxometalate structures and use them study the redox chemistry and stability of the complexed metals. Specifically, we are looking to understand the binding and redox chemistry of technetium-99, a radioactive metal that comprises a large component of the radioactive waste tanks at places like Hanford and Savanah River. Tc-99 is highly mobile in the environment and its remediation depends on its extraction from the waste matrix and then its oxidation state stabilization. POMs are highly versatile metal oxides that provide well defined surfaces or vacancies that can complex Tc-99 (and its surrogate Re) and allow us to begin to understand the properties required to bind and stabilize it. The results from this project are geared towards the remediation and development of technetium-99 extraction chelates and viable waste forms.

Computational methods in condensed matter: In this project I work closely with Professor Gustavo Lopez to compute theoretical properties for systems in the nanoscale, i.e. hydrogen inside of fullerenes, nickel-palladium clusters, and CdSe ultra small clusters. For these projects the computational team develops and implements computational techniques and I work with them to analyze and frame the results in a general content. While I do not write the computational code for these projects, I am part of the team who interprets the results and often provide the links to experimental outcomes.

Design and study of a resource rich General Chemistry program: (In collaboration with Professor Pamela Mills at Lehman College). In this project, we are integrating technology into the general chemistry curriculum through the design and study of a hybrid course that can be run face to face or fully online. This is a multi-faceted research program that involves the development of new teaching strategies and course materials (including a series of powerpoint animated video modules to enhance visual learning and the use of in-class peer-instruction through workshops and i-clicker modules). In addition to the design of the materials, the research program also includes a rigorous assessment of the effectiveness of the new strategies (videos, clickers, peer instruction) in terms of both how students use the resources and their potential for enhancing student success. We are fortunate in this study to be able to compare student success in general chemistry on multiple campuses in a variety of course styles (from fully online to a video infused- active lecture). The results from this project will help us better understand how a variety of students learn in the 21st century and thus lead to the design of more effective teaching strategies.

Evaluation of college science preparatory courses: (In collaboration with Professor Pamela Mills from Lehman college and Dr. Gabriela Smeureanu from Hunter College). In this project we are evaluating of the effectiveness of college science preparatory courses to help students cope with the transition from high school to college. Specifically, we are looking to better understand which students are adequately prepared for general chemistry and the impact that a college preparatory course can have on their potential to stay in science and their college careers in general. The results from this study will inform our general chemistry placement and student success strategies.

Inquiry-based laboratory design: In this project we are designing and evaluating a series of new laboratory experiments and courses that integrate an inquiry-based approach to scientific teaching and learning. The literature provides plenty of evidence that inquiry and experiential learning practices lead to better student understand and retention in science, but these practices are not yet widely adopted because of the potential difficulties in designing and maintaining them. This project

aims to develop best practices and guidelines that will help faculty develop and sustain laboratory curriculum that enhance student success and heighten student interest in science.

RESEARCH FUNDING

Current Funding:

2018	NIH RISE (co-PI)	$1 237,955	NIH
2015	IUSE – DUE-1525032 (PI)	$265, 731	NSF

Completed Funding:

2017	GRTI ROUND 19 (Co-PI)	$84, 000	CUNY
2016	PSC-CUNY 69349-00 47 (PI)	$3, 500	CUNY RF
2016	GRTI Round 18 (PI)	$51,180	CUNY
2016	ASRC SEED Award (PI)	$10, 000	CUNY ASRC
2015	CUNY ADVANCE (PI)	$168,735	CUNY
2015	Start-Up Funding	$80, 000	Lehman College
2014	PSC-CUNY 67467-00 45 (PI)	$3, 500	CUNY RF
2012	PSC-CUNY 65180-00 43 (PI)	$3, 500	CUNY RF

Submitted, but not funded Grant applications:

2018	NSF REU (PI)	National Science Foundation (NSF)
2016	NIH RISE (Co-PI)	National Institute of Health (NIH)
2015	NIH MARC (co-PI)	National Institute of Health (NIH)

PUBLICATIONS

Papers published (or submitted for publication):

1. Shejla Pollozi, Ibrahim Hadad, Aanchal Tyagi, Pamela Mills and Donna McGregor. *Using Clickers in a modified form of Peer instruction in General Chemistry: A taxonomy and teaching methodology*. **2019**, (Submitted for publication).
2. Kugelmas, S.; López-Morales, G.; Cruz, A.; McGregor, D.; López, G.E., *Study of magnetization of doped two-dimensional materials using the Ising model,* Appl. Phys. Lett. **2018** (submitted).
3. Frank, H; Joseph, W; McGregor, D., López, G.E., *The electronic structures of Nickel-Palladium alloy clusters: A density functional theory study,* Chem. Letters. **2018**, Vol 47, No. 4, 2018, 458-460 https://doi.org/10.1246/cl.171118
4. Melissa A. Deri, Pamela Mills, Donna McGregor. Flipping the Classroom to Level the Playing Field: Enhancing Student Performance in General Chemistry. Journal of College Science Teaching. Vol. 47, No. 3, **2018**, 68-77 (DOI: 10.2505/4/jcst18_047_03_68)

5. Melissa A. Deri, Donna McGregor, and Pamela Mills. Using Technology To Flip and Structure General Chemistry Courses at a Large Public University: Our Approach, Experience, and Outcomes. **2017**, in *Teaching and the Internet: The Application of Web Apps, Networking, and Online Tech for Chemistry Education.* Chapter 5. pages 75-97 (DOI:10.1021/bk-2017-1270.ch005)
6. Binh Nguyen, Anthony Cruz, Donna McGregor and Gustavo E Lopez. Stability of Molecular Hydrogen: A Path Integral Monte Carlo Study, *Physics Letters A*, Volume 381, Issue 4, 30 January **2017**, Pages 298-300 (https://doi.org/10.1016/j.physleta.2016.10.047)
7. Stefan Mundwilere, Henrik Braband, Roger Alberto, Donna McGregor, Robertha C. Howell, Lynn C Francesconi. *Bis(Tetraethylammonium)fac-tribromotricarbonylrhenate(I) and –technetate(I).* Inorg. Syntheses. **2014**, 36, 154-159 (DOI: 10.1002/9781118744994.ch29)
8. Donna McGregor, Benjamin P. Burton-Pye, Wayne W. Lukens, Jr., Robertha C. Howell, Lynn C. Francesconi. *Insights into stabilization of the $^{99}Tc^{V}O$ core for synthesis of $^{99}Tc^{V}O$ compounds.* Eur. J. Inorg. Chem., **2014**, 6, 1082-1089 (DOI: 10.1002/ejic.201301034)
9. Donna McGregor, Benjamin P. Burton-Pye, Israel-Martyr Mbomekalle, Pablo A. Aparicio, Susanna, Romo, Xavier Lopez, Josep M. Poblet, Lynn Francesconi. *^{99}Tc and Re Incorporates into Metal Oxide Polyoxometalates: Oxidation State Stability elucidated by Electrochemistry and Theory.* Inorg. Chem., **2012**, 51 (16), pp 9017-9028
10. Donna McGregor, William V Sweeney, Pamela Mills. *The Design of a Mercury Free Apparatus for teaching the Ideal Gas Law PV = nRT.* J. Chem. Educ., **2012**, *89* (4), pp 509–512
11. Benjamin P. Burton-Pye, Ivana Radivojevic, Donna McGregor, Israel M. Mbomekalle, Wayne W. Lukens, Jr.[4]; Lynn C. Francesconi. *Photoreduction of ^{99}Tc pertechnetate by nanometer-sized metal oxides: new strategies for formation and sequestration of low-valent technetium*. J. Am. Chem. Soc., **2011**, *133* (46), pp 18802–18815
12. Donna McGregor, Benjamin P. Burton-Pye, Robertha C. Howell, Israel M. Mbomekalle, Wayne W. Lukens, Jr., Fang Bian, Edward Mausolf, Frederic Poineau, Kenneth R Czerwinski, and Lynn C. Francesconi. *Synthesis, structure elucidation and redox properties of ^{99}Tc complexes of lacunary Wells Dawson polyoxometalates: insights into molecular ^{99}Tc – metal oxide interactions.* Inorg. Chem., **2011**, *50* (5), 1670–1681
13. B.P. Burton-Pye, D. McGregor, I.M. Mbomekalle, L.C. Francesconi. *Investigation of New Strategies for the reduction of redox active radiometals Re-188/186 ad Tc-99m.* Nuclear Medicine and Biology, **2010**, 37 (6), 687-688
14. Cheng Zang; Laurence Bensaid; Donna McGregor; Xikui Fang; Robertha C. Howell; Benjamin Burton-Pye; Qunhui Luo; Louis Todaro; Lynn Francesconi. *Influence of the lanthanide Ion and solution Conditions on formation of Lanthanide Wells-Dawson Poloxotungstates.* Journal of Cluster Science, **2006**, 17(2), 389
15. Zhang, Cheng; Howell, Robertha C.; McGregor, Donna; Bensaid, Laurence; Rahyab, Seyar; Nayshtut, Michael; Lekperic, Safet; Francesconi, Lynn C. *Synthesis of a cluster containing Eu(III) a2-$P_2W_{17}O_{61}^{10-}$ and preliminary luminescence experiments.* Competes Rendus Chimie, **2005**, 8(6-7), 1035-1044

Manuscripts in Preparation

1. Ivana Radivojevic Jovanovic, Colleen M.B. Gallagher, Benjamin P. Burton-Pye, Donna McGregor, Wayne W. Lukens, Jr., Lynn C. Francesconi, *Strategies for the photoreduction of Tc-99 pertechnetate to low valent Tc by Keggin polyoxometalates*
2. Dembowski, M.; Lukens, W.W.; Cruz, A.; Althour, A.; Burton-Pye, B.P.; López, G.E.; McGregor, D.; Francesconi, L.C., *Synthesis and characterization of TBA_4 [$Tc^{X}M$-$PW_{11}O_{39}$] where M=O, N; Comparing Tc^{V} and Tc^{VI} in metal oxides matrices*.

3. Melissa Deri, Pamela Mills, Laura Oliveira, Shejla Pollozi, Yoko Bian, Jamaal Lake, Donna McGregor. *A Random control trail comparing student outcomes and video usage in general chemistry.*
4. Gabriela Smeureanu, Pamela Mills, Donna McGregor. *CHEM 115 – A New Model for Under-prepared First Year Chemistry Students and the impact on their retention in science.*
5. Anthony Cruz Balberdy, Binh Nguyen, Ordy Manuela Gnewou, Joshua Molina, Donna McGregor, Gustavo Lopez. *Understanding the structure and stability of $Re^{V}O$-FGC and $Re^{V}O$ FKC: insights into the peptide features that stabilize the $Re^{V}O$ metal-chelate core*.

CURRICULUM VITAE

Pamela Mills

Education

George Washington University, Washington D.C., Chemistry, **B.S. 1979**
University of Wisconsin, Madison, Wisconsin, Chemistry, **M.S. 1982**
University of Wisconsin, Madison, Wisconsin, Physical Chemistry, **Ph.D. 1985**
University of California, San Francisco, SF, California, Chemistry, **1985-1989**

Career Details

Sept 2018 -	**Interim Dean**, School of Natural and Social Sciences, Lehman College, NY
Jan 2015 - Aug 2018	**Professor and Chair,** Dept. of Chemistry, Lehman College, NY
Jul 2007 - Jan 2015	**Deputy Chair,** Dept of Chemistry, Hunter College, New York, NY
Jan 2001 - Jan 2015	**Professor**, Dept. of Chemistry, Hunter College, New York, NY
Jan 1995 - Jan 2001	**Associate Professor**, Dept. of Chemistry, Hunter College, NY, NY.
Sep 1989 - Jan 1995	**Assistant Professor**, Dept. of Chemistry, Hunter College, NY, NY.
Jun 1987 - Jun 1989	**Postdoctoral Scholar,** Department of Pharmaceutical Chemistry University of California, San Francisco, CA.
Sep 1985 - Jun 1987	**Anesthesia Postdoctoral Fellow** Departments of Pharmaceutical Chemistry and Anesthesia, University of California, SF, CA.
Jan 1982 - Aug 1985	**Research Assistant** University of Wisconsin, Madison, WI.
Jan 1981 - Aug 1981	**Teaching Assistant** University of Wisconsin, Madison, WI.

Honors and Awards:

Digital Learning Innovation Award, OLC; Presidential Award for Excellence in Teaching, Hunter College; Eugene Lang Junior Faculty Award, Hunter College; George P. Town Fellow, Univ. of Wisconsin—Madison; Board of Trustees Scholarship, George Washington University

Teaching

CHE 166, General Chemistry 1
CHE 168, General Chemistry 2
CHE 169, General Chemistry 2 Lab
CHE 344, Physical Chemistry in Kinetics and Thermodynamics

Research Description

Although traditionally trained in physical chemistry, my career turned towards chemistry education and even towards discipline-based education research (DBER). My work in science education addresses new ways to increase access to science careers for students historically excluded from the science pipeline and thus aligned with the mission and goals of CUNY. In the past 25 years I have been PI on four highly successful major institutional grants (Lehman, Hunter and CUNY-wide) to improve classroom instruction in high school and college and have been co-PI on teacher education and graduate education NSF grants. Drawing on my disciplinary and pedagogical experiences I have written curricula for high school courses, college laboratory courses, introductory-level General Chemistry and advanced Physical Chemistry courses as well as for professional development workshops on innovations in STEM courses. Five years ago, I began a collaboration with co-PI McGregor to develop what, at the time, was called "flipped" instruction. We produced over 180 videos and created a highly-structured course that used a very active classroom pedagogy. The course, developed at Hunter College and then brought to Lehman College, produced dramatic improvements in student performance and has reduced the persistent achievement gaps in performance observed between African American/Hispanic students and white/Asian students from 30% to under 10% and in some semesters to no observed gap at all! Our work was recognized by the Online Learning Consortium's 2016 Digital Learning Innovation Award. The curricular work is supported by education research to determine how students succeed in the flipped classroom and assess the role of embedded tutors, active learning, and video instruction.

Current Funding:

co-PI, "Developing a Growth Mindset Model to Build Resiliency in STEM Students", NSF, $4,999,848 3/28/18-3/27/23, with Seher Atamturktur (PI), L. Montenegro, 3/28/18-3/27/23

PI, "Math/Science Partnership in New York City (MSPinNYC2)", NSF, $9,999,987 7/15/11 to 8/31/19, with S. Bonner, L. Keiler, J. Liou-Mark, D. McNamara. (The PERC Program).

co-PI, "Investigating Student Learning and Metacognition in Flipped Classroom and Interactive Lecture Environments in General Chemistry", 10/01/15-9/30/19 $265,731"

PI, "OER for Introductory Chemistry – Design of a Video Backbone", CUNY, $10,000, with V. Flaris, D. McGregor

Prior Funding Record:

co-PI, "IGERT: Returning the Radio to Chemistry: Integrating Radiochemistry into a Chemistry Ph.D. Program", NSF, $3,199,812, with L Francesconi (PI), J. Lewis, S. Jurisson, C. Drain

co-PI, "Noyce Teacher Academy Scholar Program", NSF, $749,996, 08/15/08-07/31/12

PI, "Math/Science Partnership in New York City (MSPinNYC)", NSF, $12,999,000 (7/15/04- 6/30/09)

PI, "The Development of Three New Five-Year BA/MA Programs in Biology, Chemistry, and Physics and in Teacher Education", NSF, $794,344 (6/27/02 to 5/31/05)

PI, Course and Curriculum Development (CCD) program, NSF, for Development of an Integrated Science curriculum, 4/96-3/00, $349,948

FIPSE for Development of an Integrated Science (chemistry, physics and mathematics) core curriculum, 9/95-8/98, $254,769

PSC-CUNY 7/98-7/99, $2,500

PSC-CUNY 7/94-7/95, $4,000

Petroleum Research Fund 7/92-6/94, $21,000

PSC-CUNY 7/93-7/94, $4,000

PSC-CUNY 7/92-7/93, $4,000

ACS Project SEED, Summer 1990, $2,000; Summer 1991, $1,200

Publications

Related to Education

"Using clickers in a modified form of Peer Instruction in General Chemistry: A taxonomy and teaching methodology." Pollozi, S.; Hadad, I.; Tyagi, A.; Mills, P.; McGregor, D., submitted American Chemical Society book chapter, 2019.

"Structure and Evaluation of a Flipped General Chemistry Course as a Model for both Small and Large Gateway Science Course at an Urban Public Institution." Deri, M. A.; Mills, P.; McGregor, D. *J. College Sci Teaching,* 2018, 68-77.

"Flipped General Chemistry 1", Donna McGregor, Pamela Mills, Tophat Video and Problem Solving Support Course, 2018, 90 videos, 400 problems, pilot phase at one college.

"Using Technology to Flip General Chemistry Courses at a Large Public University". In Teaching and the Internet: The Application of Web Apps, Networking, and Online Tech on Chemistry Education, Deri, M. A.; McGregor, D.; Mills, P.; Christiansen, M.A., Weber, J. M., Eds.; American Chemical Society: Washington D.C., 2017.

"Flipped General Chemistry", Donna McGregor, Pamela Mills, Sapling/Macmillan Course for General Chemistry, 180 videos, 300 problems, Adopted by 4 colleges, 2016-2018 academic years.

"Designing a Flipped Classroom Video Backbone", Donna McGregor, Pamela Mills, *Flipped Chemistry* at *flippedchemistry.com* invited blog post, Monday August, 25 (2014)

"A Simple Mercury-Free Laboratory Apparatus to Study the Relationship between Pressure, Volume, and Temperature in a Gas," Donna McGregor, William V. Sweeney, and Pamela Mills, *J. Chem. Edu,* Publication Date (Web): January 27, 2012 (Article)

"Using the First Exam for Student Placement in Beginning Chemistry Courses," P. Mills, W. Sweeney, S. Bonner (2009) *J. Chem. Edu,* 86, 738-743.

Letter to the Editor: Does Test Prep Have a Place in the Classroom?, W Sweeney, P Mills, *New York Times,* June 24, 2008.

"Bond breaking misconception" P. Mills, W. Sweeney (2007) *Journal of College Science Teaching,* 37, 11.

Study Guide for The Practice of Chemistry, D. Wink, Freeman (2004)

"Experiencing and Visualizing the First Law of Thermodynamics," P. Mills, W. Sweeney, W. Cieniewicz, (2001) *J. Chem. Edu,*78, 1360-1361.

S. Demeo, P. Mills, "Looking for Linearity: Integrating Graphing for First Year Chemistry Students", (2001) *Chemical Educator*.

"A New Approach to Teaching Introductory Science: The Gas Module," P. Mills, W. Sweeney, R. Marino, S. Clarkson, (2000) *J. Chem. Edu*., 77, 1158-1161.

"Using Poster Sessions as Examinations: The Poster Exam", P. Mills, S. DeMeo, W. Sweeney, R. Marino, S. Clarkson, (2000) *J. Chem. Edu,* 77, 1161-1165.

22 Publications not related to Education

Synergistic Activities

Related to Flipped & Active Instruction & Supplemental Instruction: Development of over 180 short instructional videos for use in General Chemistry I and II flipped classes (2014-2019); Led Mathfor American Workshop on Flipped and Active Learning, Fall 2017, *Invited Talks: "*Active Teaching and Learning*",* Florida Gulf University, April 2018; *"*A Structured, Flipped, Active Learning Classroom for General Chemistry", 217 $2YC_3$ Keynote, BCC, May 2017; "Supporting a Flipped Classroom Model Using Peer Led Team Learning and Supplemental Instruction", CRLA Northeast Conference, March 2017; "The Flipped Classroom to Improve Student Performance, Part 1 and Part 2 and Convocation", BMCC, NY, NY Sept & Dec 2016, Jan 2017; "The Flipped Class in General Chemistry: A Case Study", Austin TX, April 2015; "Active Course Design: A Demo and Discussion", Lehman College March 2015; Webinar hosts for Flipped Classroom (2014)

Related to High School Supplemental Instruction (PERC):
Head of the PERC Program (2009-2016); *Invited Talks*: Gordon Research Conference Invited Speaker; "Reshaping Interactions in Urban Science Learning Environments: The Peer Enabled Restructured Classroom" National Association for Research in Science Teaching Annual Conference. Puerto Rico. (2013); The High School College Transition in STEM, BARD High School Early College Speaker Series (2013); Bonner, S., Keiler, L. & Mills, P. (2012). PERC: A Model for Peer-facilitated Learning in Urban Secondary School Classrooms. PLTL Society International Conference. New York.; Bonner, S., Keiler, L. & Mills, P. (2012). Math Science Partnership in New York City 2: A New Partnership to Transform Urban Secondary School Mathematics and Science Experiences. UCARE national conference. New York.; Bonner, S., Keiler, L. & Mills, P. (2012). Effective Teaching through Peer Instructors: Pursuing Possibilities and Meeting Challenges. The National Science Foundation's MSP LNC conference. Washington, DC; P. Mills, (2011) Serving Science Lecture Series, CUNY

Other Education Related: Development of inquiry-based laboratory experiments for use in one-semester General Chemistry classes, published by Hayden-McNeill and adopted in two colleges; Development of written instructional materials for General Chemistry I and II (2012); Board Member for Math4Science (2015);

Collaborators & Other Affiliations

Collaborators Over the Last 48 Months

Melissa Deri, Lehman College; William Sweeny, Hunter College, Retired; Donna McGregor, Lehman College; Sarah Bonner, Hunter College; Leslie Keiler, York College; Luis Montenegro, Bronx Community College; Seher Atamturktur, Bronx Community College; Brian Zeglis, Hunter College; C. Michael Drain, Hunter College;

Graduate and Postdoctoral Advisors

Professor Frank Weinhold, Dept. of Chemistry, Univ. of Wisconsin, Madison, WI.
Professor M. Thomas Record, Jr., Dept. of Chemistry, Univ. of Wisconsin, Madison, WI.
Professor Thomas James, Dept. of Pharm. Chemistry, Univ. of California, San Francisco, CA.

CURRICULUM VITAE

Naphtali O'Connor
Associate Professor of Chemistry
Lehman College, City University of New York

EDUCATION

2000-2006 Ph.D in Chemistry, University of California, Irvine
1996-2000 B.Sc. in Chemistry, SUNY, Stony Brook

CAREER DETAILS

2007-2008 Postdoctoral Researcher, Columbia University
2008-2015 Assistant Professor, Lehman College
2015-present Associate Professor, Lehman College
2010-present Faculty of Biochemistry and Chemistry programs, The Graduate Center, City University of New York

AWARDS

1998 United Negro College Fund Merck Fellow
1998 Minority Access to Research Careers(MARC) Fellow
2001 UC Irvine Faculty Mentor Fellow
2009 NSF Sponsored Travel Award for Young Faculty
2010 Stewart Travel Award

MEMBERSHIPS

American Chemical Society

TEACHING

- CHE 120 Essentials of Organic Chemistry Lecture
- CHE 232-235 Organic Chemistry I and II Lectures and Laboratories
- CHE 391 and 491 Chemical Investigations
- CHE 450 Seminar
- CHE 449 Instrumental Analysis

RESEARCH

In my lab we recently developed a new synthesis for preparing polysaccharide-polyamine based hydrogels and evaluated their antimicrobial properties. Building on this we further developed this methodology to crosslink polysaccharides with diamino acids. Using this methodology we have incorporated the polyamine polydopamine in hydrogels to create antioxidant hydrogels. Our current goals are to further develop these antioxidant biomaterials for use as wound dressings for chronic wounds that employ a multi-pronged approach to halt inflammation and stimulate proliferation. We have also synthesized biodegradable curcumin polymers that showed anti-cancer activity.

RESEARCH FUNDING

2019-2020 TRADA-50-78, PSC-CUNY Research Awards (Traditional A) "Hydrogels for Treating Chronic Wounds" $3000

2016-2017 CUNY Research in the Classroom Grant "Role-Playing to Replace the Traditional Laboratory Experiment" $7500

2015-2019 NIH—SC3 GM111194-01A1 "Polysaccharide-Polyamine Hydrogels", $471,444

2015-2016 PSC-CUNY Grant— TRADA-46-77 "Biodegradable Curcumin Polymers with Anti-cancer Activity" $3000

2013-2014 PSC-CUNY Grant— TRADA-44-228 "Cationic Antimicrobial Biomaterials" $3000

2012-2013 PSC-CUNY Grant— TRADB-43-164 "Targeting Metal-Induced Amyloid Aggregation and Neuroinflammation" $6000

2010-2011 Clinical & Translational Science Center planning award "Effect of Mercapto Pyridyl Ligands on Amyloid-β Aggregation and Neurotoxicity" $5,000

2009-2010 PSC-CUNY Grant – PSCOOC-40-105 "The Effect of Structure on the CO2 Absorption Ability of Amines" $3,300

PUBLICATIONS

10. Naphtali A. O'Connor, Lisa S. Einbond, Stephen Redenti, Moira Sauane, Andrei Jitianu "A Self-degradable cucumin polymer with anti-cancer activity" *J. Appl. Polym. Sci.* (**2018**) 135, 46867-46872.
11. Naphtali A. O'Connor, Mihaela Jitianu, Greisly Nunez, Quentin Picard, Madeline Wong, David Akpatsu, Adam Negrin, Rajendra Gharbarand, Daniel Lugo, Sundus Shaker, Andrei Jitanu, Stephen Redenti "Dextran hydrogels by crosslinking with amino acid diamines and their viscoelastic properties" *Int. J. Biol. Macromol.* (**2018**) 111, 370-378.
12. Naphtali A. O'Connor, Navzer D. Sachinvala and Iraj Ganjian "Preparation of 2-Arylethynylselanylacetonitriles from 4-Aryl-1,2,3-Selenadiazoles" *Het. Chem.* (**2015**) 52, 1167-1169.
13. Naphtali A. O'Connor, Ahmad Abugharbieh, Emmanuel Buabeng, Farzana Yasmeen, Steve Mathew, Diana Samaroo, Hai-Ping Cheng "The Crosslinking of Polysaccharides with Polyamines and Dextran-Polyallylamine Antibacterial Hydrogels" *Int. J. Biol. Macromol.* (**2015**) 72, 88-93.
14. Diana Samaroo, Evelyn Perez, Amit Aggarwal, Andrew Wills, Naphtali O'Connor "Strategies for Delivering Porphyrinoid-based Photosensitizers in Therapeutic Applications" *Therapeutic Delivery* (**2014**), 5(7), 859-872.

15. Amanda Muraca, Naphtali O'Connor, Ravnit Kaur-Bhatia, Nicoleta Apostol, Andrei Jitianu, Mihaela Jitianu "Titanium Dioxide Nanocomposites — Synthesis and Photocatalysis" *Processing and Properties of Advanced Ceramics and Composites VI: Ceramic Transactions* **(2014)** 249, 123-135.
16. Naphtali A. O'Connor, Gustavo E. López and Antony Cruz "Quinoline-2-thiol Derivatives as Fluorescent Sensors for Metals, pH and HNO" *Current Chem. Lett*. (**2014**) 3(3), 189-194.
17. Solomon, Marissa R.; O'Connor, Naphtali A.; Paik, David C.; Turro, Nicholas J. "Nitroalcohol Induced Hydrogel Formation in Amine-Functionalized Polymers." *J. Appl. Polym. Sci. (***2010***),* 117(2), 1193-1196.
18. O'Connor, Naphtali A.; Stevens, Stevens; Samaroo, Diana; Solomon, Marissa R.; Martí, Angel A.; Dyer, Joanne; Vishwasrao, Harshad; Akins, Daniel L.; Kandel, Eric R.; Turro, Nicholas J. "A covalently linked phenanthridine-ruthenium(II) complex as a RNA probe**.**" *Chem. Comm.* (**2009**), 2640-2642.
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20. Berro, A.J., Gu, X., O'Connor, N., Jockusch, S., Nagai, T., Ogata, T., Zimmerman, P., Rice, B.J., Adolph, E., Byargeon, T., Gonzalez, J., Turro, N.J., Grant Willson, C. "Optical threshold layer and intermediate state two-photon PAG approaches to double exposure lithography " *Proc. SPIE* (**2009**), 7273.
21. O'Connor, Naphtali A.; Bero, Adam; Lancaster, Jeffery R.; Gu, Xingu; Jockush, Steffen; Nagai, Tomoki; Ogata, Toshiyuki; Lee, Saul; Zimmerman, Paul; Willson, C. Grant; Turro, Nicholas J. "Toward a sequential two photon photoacid generator for double exposure photolithography." *Chem. Mater.* (**2008**), 20(24), 7374-7376.
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23. O'Connor, Naphtali A.; Liberman, Vladimir; Lei, Xuegong; Lopez-Gejo, Juan; Turro, Nicholas J.; Zimmerman, Paul A. "Degradation of Hydrocarbon Fluids in the Immersion Lithography at 193 nm." *J. Photopolym. Sci. Technol.* (**2008**), 21(5), 607.
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Preventing lens photocontamination and identifying optical behavior of LuAG" *Proc. SPIE* (**2008**),6924.
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30. Edmondson, Scott D.; Mastracchio, Anthony; He, Jiafang; Chung, Christine C.; Forrest, Michael J.; Hofsess, Scott; MacIntyre, Euan; Metzger, Joseph; O'Connor, Naphtali; Patel, Kajal; Tong, Xinchun; Tota, Michael R.; Van der Ploeg, Lex H. T.; Varnerin, Jeff P.; Fisher, Michael H.; Wyvratt, Matthew J.; Weber, Ann E.; Parmee, Emma R. **"**Benzyl vinylogous amide substituted aryldihydropyridazinones and aryldimethylpyrazolones as potent and selective PDE3B inhibitors." *Bioorg. Med. Chem. Lett.* (**2003**), 13(22), 3983-3987

Appendix B

Course Syllabi

Spring 2019: CHE 114
Essentials of General Chemistry
Section A01: Online Instruction

Instructor: Dr. Melissa Deri, Assistant Professor, Department of Chemistry
Email: melissa.deri@lehman.cuny.edu
Online Office Hours via Zoom: Monday, 2-3 pm or by appointment
In-Person Office Hours: Wednesday, 10-11 am or by appointment
Physical Office: 326 Davis Hall, Lehman College, CUNY

Welcome!

Chemistry is all around us: in the food we eat, in the clothes we wear, in the technology you are using to read this right now, and in you yourself! In this course we will introduce the basic principles of chemistry starting from individual atoms and molecules through chemical reactions and applications. We aim to connect observable features in our everyday lives to the chemical foundations behind them.

The course will be taught in an online model with the primary delivery of course content through a series of custom-made course videos supported by a variety of online assignments and assessed by in-person exams. This section will have a small class size and rely on digital communication to build a community of learners within the course platforms. The course is asynchronous, meaning you do not have to log in at any specific times, so it offers you more flexibility than the in person course, however it requires an equal time commitment as a traditional face-to-face course. Please read through this document thoroughly, familiarize yourself with both course websites, and always feel free to reach out with questions!

Course Description

CHE 114: Essentials of General Chemistry Lecture: *3 credits. Essentials of chemistry and their applications to inorganic chemistry. PREREQ: MAT 104 or satisfaction of requirements for placement into precalculus (MAT 172).*

Goal of the course: This is a one-semester general chemistry course to prepare you for a health science-based career. Essentials of General Chemistry is a demanding course and while its primary objective is to introduce you to the fundamental principles that underlie the chemical sciences, to achieve success in this course you will need to organize large quantities of information in coherent ways so that you are able to recall and apply your knowledge. Organization of your time will be essential!

How This Course Works: This section of *Essentials of General Chemistry* is run as an online course with in-person exams. In this model you will watch videos and complete online assignments from home, then come in to Lehman to take your exams.

Time Requirements: You should plan to spend ***at least*** **10-15 hours per week** watching videos, doing your online homework, engaging with your classmates and learning the material. It is your responsibility to keep up with the material – it is unlikely that you will be able to catch up if you fall behind.

Technology Requirements: You need semester-long access to a computer with a reliable internet connection. You will need a webcam and microphone to engage fully in course discussions and activities.

Since this is an online course you have to make sure to regularly check your CUNY email for course updates and communication. If you do not check your email regularly it is possible that you will miss important information - which is likely to have a negative impact your grade. You will also need a scientific calculator to help with assignments and which you are required to bring for the exams.

Instructional Technology: As part of this course we will be using two course platforms: Blackboard and Sapling Learning. You should log on to both as soon as you can so that you can familiarize yourself with the look and feel of the web interfaces.

Blackboard: You should automatically gain access to the Blackboard site if you have registered for the course. All course announcements, course documents (syllabus, pacing guide, learning goals, grading scheme, video table of contents), and old CHE 114 practice exams will be posted on Blackboard. You will also engage in discussion boards and complete Guided Problem Solving assignments there.

For help with Portal/Blackboard Username or Password problems: Lehman HELP DESK in the IT Center in Carman Hall (ext. 1111). Off campus: (718) 960-1111 http://www.lehman.edu/itr/about-it-center.php

Sapling: You will need to actively create an account on Sapling and purchase an access code in order to register for our specific course site. The cost for ONE semester of access is $47.00, and the cost for TWO semesters of access is $60.00. The follow up to this course in most programs, CHE 120 Essentials of Organic Chemistry, also uses this site so if you plan on taking that as well the two semester package may be advantageous. It is imperative that when the course starts on **Friday, January 25th**, you are already registered on the Sapling website.

To register for Sapling:

1. Log on to https://www.saplinglearning.com/ibiscms/login/
2. Click on the blue "create an account" tab and follow the online instructions to create a user profile (choose a username and password). Please make sure that you use the same email address to claim your Sapling account and access Blackboard.
3. Select **City University of New York, Lehman College** as your school
4. Select **City University of New York (CUNY), Lehman College - Online Section - Spring19 - DERI** as your course.
5. Follow the online instructions to purchase an Access Code.

The Sapling website we will use has been designed specifically for our course. This is where you will complete the Learning Goal Analysis (LGA) assignments, watch the course videos, and complete online Sapling homework assignments.

Course Components

The assignments described below are all included in a typical course unit. We recommend you complete them in the order they are described below.

Learning Goal Analysis (LGA): Before you begin a new unit, you will be required to complete a Learning Goal Analysis on Sapling. This analysis asks you to read each learning goal for that topic and assess how comfortable you feel with the content presented. There is no wrong answer to an LGA question. The goal is to help you begin accurately self-assessing your own content understanding and focus your attention on the learning goals to drive your learning. These learning goals serve as both an outline for the course and a tool to help you prepare for your exams. Use the LGA to study for your exams. Every single Exam question is based on at least one learning goal (although some will contain multiple learning goals). There is also an LGA document in the Course Documents folder on Blackboard that can be used to review the learning goals.

Course Videos & Video Certification: This course is built around a video backbone that provides the initial exposure to the course content. Each video uses a combination of narration and visuals to explain part of a topic and ends with a Let's Practice problem demonstrating how the content is meant to be applied. You should take notes during the videos and work through these problems as your watch. You must watch the videos for a given unit on Sapling prior to starting the assignments and complete a Video Certification assignment on Sapling to confirm that you have watched them.

Guided Problem Solving: Every unit will have a corresponding GPS assignment on Blackboard using VoiceThread. These are a series of 8 questions, half presented with instructor-provided fully explained solution videos and half requiring students to post their own solutions and explanations. These questions are meant to highlight important concepts for each unit.

Homework Assignments: For this course we will be using an online homework system built into Sapling. All the assignments and due dates are found within the course site. There are two kinds of online homework assignments: Skills Practice and Synthesis. There is a 3 question Skills Practice assignment linked to each unit video. Then each unit has a summative Synthesis assignment of varying lengths.

Discussion Boards: Every unit on Blackboard contains its own Discussion Board forum. These are meant for students to post any questions about that unit's content whether it be a general question or an issue with a specific homework problem. Students are encouraged to try to answer each other's questions and the discussion boards will be monitored by the instructor as well.

Optional Text: For the purpose of this class you will not be required to buy a textbook. You can however, use ANY General Chemistry textbook. The Sapling platform includes a digital e-book. We will not be working through a textbook in a chapter-by-chapter fashion; rather we will cover 17 chemistry topics and you can use a textbook as a reference. *If you feel the need to buy a print textbook, Chemistry, 8th Ed., Zumdahl and Zumdahl is a wonderful choice.*

Assessment/Grading

Grading Policy: To earn full credit in this course you must accumulate 750 points. 250 points come from your UNIT grade and 500 points come from your EXAM grades. Please see the Grading Scheme (below & on Blackboard) for details. Every component of this course earns you points towards your final grade, but to earn your points you must complete each component by its due date (see Pacing Guide on next page).

The total number of points you earn will be normalized to a score out of 100.00 and then assigned a letter grade according to the table shown to the right. Letter grades will be determined based on a score to 2 decimal places. There will be no further rounding of scores to determine letter grades.

Letter Grade	Score Earned
A	92.50
A-	90.00
B+	87.50
B	82.50
B-	80.00
C+	77.50
C	70.00
D	60.00
F	<60

Exams: There will be three equally weighted in-person exams (100 points each for a total of 300 points) given during the course of the semester. There will also be a Comprehensive Final Exam (200 points) given during finals week. If your final exam grade is higher than your lowest in-class exam grade your final grade will count for 300 points and your lowest in-class exam grade will be dropped.

For your exams you will be required to bring a pencil and a calculator to class. All other materials (e.g. periodic table and other necessary information) will be provided for you. Exams must be taken during the designated time. *NO MAKE-UP EXAMS will be given*. If you miss one in-class exam you will earn a grade of zero for that exam. This grade will then be dropped as your lowest in-class exam grade and your final exam grade will automatically be counted for 300 points. If you miss more than one in-class exam you will receive a grade of ZERO for the second missed exam.

UNIT	LGA[1]	Videos	Guided Problem Solving / Review	Discussion Boards	Homework[2]	Unit Total[3]	In-Class Exams[4]	Final Exam[4]
Intro	-	-	-	3	-	3		
Unit 1	1	1	6	2	5	15		
Unit 2	1	1	6	2	5	15		
Unit 3	1	1	6	2	5	15	Exam 1 (100 pts)	
Unit 4	1	1	6	2	5	15		
Unit 5	1	1	6	2	5	15		
Unit 6	1	1	6	2	5	15		
E1 Review	-	-	6	2	-	8		
Unit 7	1	1	6	2	5	15		
Unit 8	1	1	6	2	5	15		
Unit 9	1	1	6	2	5	15	Exam 2 (100 pts)	200 pts
Unit 10	1	1	6	2	5	15		
Unit 11	1	1	6	2	5	15		
E2 Review	-	-	6	2	-	8		
Unit 12	1	1	6	2	5	15		
Unit 13	1	1	6	2	5	15		
Unit 14	1	1	6	2	5	15	Exam 3 (100 pts)	
Unit 15	1	1	6	2	5	15		
Unit 16	1	1	6	2	5	15		
E3 Review	-	-	6	2	-	8		
Final Review	-	-	8	-	-	8		
TOTALS	**16**	**16**	**120**	**43**	**80**	**275**	**300**	**200**
Total Unit Grade Required = 250 out of a total of 275 possible points							**Total Exam Grade = 500**	
Total number of points to be earned in the course: 250 + 500 = 750								

Detailed Course Outline: Within Blackboard, the course is broken down into 15 modules corresponding to the 15 weeks of class. Each module details the units covered that week and the required assignments. All Sapling assignments have specific due dates listed. Please see the Course Pacing Guide (below and on Blackboard) for a detailed course schedule that includes all your assignments and exam dates. In addition, we have created a Video Table of Contents (also on Blackboard) with a video breakdown of each unit including the required viewing time to help you organize your time effectively.

Module	Dates	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
1	1/28-2/3	Intro & Unit 1						
2	2/4-2/10	Unit 2 & Unit 3						
3	2/11-2/17	Unit 4 & Unit 5						
4	2/18-2/24	Unit 6 & Exam 1 Review						
5	2/25-3/3	**Exam 1**	Unit 7					
6	3/4-3/10	Unit 8						
7	3/11-3/17	Unit 9 & Unit 10						
8	3/18-3/24	Unit 10 & Unit 11						
9	3/25-3/31	Exam 2 Review						
10	4/1-4/7	**Exam 2**	Unit 12					
11	4/8-4/14	Unit 13 & Unit 14						
12	4/15-4/21	Unit 15 & Unit 16						
-	4/22-4/28	Spring Break						
13	4/29-5/5	Exam 3 Review						
14	5/6-5/12	**Exam 3**	Final Review					
15	5/13-5/19				**Final Exam Date To Be Determined!**			
Finals	5/16-5/22	**Final Exam Date To Be Determined!**						

Exam Schedule:

- EXAM 1: **Monday, February 25th**
  Think of this exam as a CHE 114 placement exam. Your score on this exam determines whether or not you have gained the knowledge required to continue in the course. If you fail this exam you should consider withdrawing from the course. *If you decide to remain in the course you should make an appointment with me to discuss your strategy for success. You will need to make a drastic change to your study habits!*
- EXAM 2: **Monday, April 1st**
  This exam is more difficult than Exam 1. If you failed Exam 1 and you also fail this exam you should definitely withdraw from the course. The last day to withdraw from the course is *Tuesday, April 9th. Grades from Exam 2 will be posted as soon as possible to allow for withdrawal decisions.*
- EXAM 3: **Monday, May 6th**
  This is your last and most difficult in-class exam. In general student grades drop by 10% from exam 2 to exam 3 so make sure you put in enough time to prepare for this exam.
- FINAL EXAM: **To Be Determined**
  The final exam is cumulative and worth twice as much as any of the in-class exams. It CANNOT be dropped.

Course Policies

Attendance Policy: The student handbook notes that "Students are expected to attend all class meetings as scheduled, and are responsible for all class work missed as a result of late registration or absence. Excessive absences in any course may result in a lower final grade." For this online course we take attendance to mean completion of course assignments within deadlines and participation in group discussion boards as well as actual presence at in-person exams.

Academic Dishonesty: While honest scholarship is time-consuming and often requires hard work, it is also the primary process by which students learn to think for themselves. Faculty members must teach respect for methods of inquiry within the various disciplines and make assignments that will encourage honest scholarship; students in turn must uphold a standard of honesty within the College, thereby affirming the value and integrity of their Lehman degree.

Academic dishonesty (e.g., cheating, plagiarism, obtaining unfair advantage and falsification of records and official documents) is prohibited in The City University of New York. Penalties for academic dishonesty include academic sanctions, such as failing or otherwise reduced grades, and/or disciplinary sanctions, including suspension or expulsion. All violations are reported to the Department and college's Academic Integrity Officer.

Academic dishonesty is a serious violation of the accepted values of the College. Students who are caught cheating on an exam in this course will automatically obtain a grade of ZERO for that exam and will be reported for Academic Dishonesty. This grade of ZERO cannot be used as your lowest exam score to be dropped in the course.

For detailed information on definitions and examples of Academic Dishonesty, including Cheating, Plagiarism, Obtaining Unfair Advantage and Falsification of Records and Documents, please refer to the student handbook or visit: http://lehman.smartcatalogiq.com/en/2017-2019/Undergraduate-Bulletin/Academic-Services-and-Policies/Academic-Integrity

Student Resources

Accommodating Disabilities: Lehman College is committed to providing access to all programs and curricula to all students. Students with disabilities who may require any special considerations should register with the Office of Student Disability Services in order to submit official paperwork to instructor.

For more information, please contact the Office of Student Disability Services, Shuster Hall, Room 238, 718-960-8441. For detailed information on services and resources visit: http://www.lehman.edu/student-disability-services/ , or email: disability.services@lehman.cuny.edu.

Please do not hesitate to contact me or the Office of Disability Services if you think you could benefit from an accommodation. You should use all available resources to give yourself the best chance for success.

The Science Learning Center (SLC): Lehman College's Instructional Support Services Program (ISSP) is home of the Academic Center for Excellence (ACE) and Science Learning Center (SLC). Both offer students an array of activities and services designed to support classroom learning.

The Science Learning Center (SLC) is the tutoring center on campus, located in Gillet Hall, room 133. The SLC provides drop-in tutoring and workshop sessions for natural and computer science courses. To obtain more information about the SLC, please visit their website at http://www.lehman.edu/issp, or please call the SLC at 718-960-7707. Regular tutoring hours for fall & spring semesters are: M-Th 10 a.m.-7 p.m., and Sat. 10 a.m.-2 p.m.

Student Handbook: Students are strongly encouraged to download and become familiar with the Student Handbook: http://www.lehman.edu/campus-life/support-services.php

Essentials of General Chemistry Laboratory
CHE 115 – Spring 2019

Instructor: Prof. Melissa Deri

Email: melissa.deri@lehman.cuny.edu

Office Hours: Wednesday 10-11 am in Davis 326 or Davis 319

Course Description: Introduction to the basic principles of chemistry using a puzzle solving inquiry based approach to laboratory experimentation.

Academic or Learning Objectives: After completing this lab, students should be able to:

- use information provided in a puzzle to design a scientific experiment that addresses a specific scientific problem.
- to make precise and accurate measurements using physical and chemical equipment and instruments.
- use measured data and theoretical concepts to solve problems.
- understand the principles that govern chemical transformations in chemical reactions.

Course Grading:

Your overall letter grade will be based on the total number of points you earn in the laboratory components of the course. This includes attendance, a safety quiz, 11 experiments and a poster presentation. The total number of points that can be earned in this course is **750.** There are **800** total points available, but only **750** points will be used to determine your final grade. This means that the lowest report grade will be dropped for every student. The total points out of 750 will be converted to a percentage (out of 100%) and scaled according to the Lehman College Grading system.

Graded element	Notebook Points	Post-Lab points	TOTAL
Attendance (5 pts per lab meeting)	-	-	60
Safety Quiz	-	-	40
Experiment 1	25	25	50
Experiment 2	25	25	50
Experiment 3	20	30	50
Experiment 4	20	30	50
Experiment 5 – Part 1 – Part 2	38 30	32	100
Experiment 6	30	20	50
Experiment 7	35	15	50
Experiment 8	30	20	50
Experiment 9	27	23	50
Experiment 10	30	20	50
Experiment 11	30	20	50
Scientific Presentation/Poster	-	-	100
Lowest Experiment grade is dropped			-50
TOTAL			**750**

Attendance Policy:
Attendance for each laboratory experiment is mandatory. You will be allowed one excused absence for the semester. Any subsequent absences will result in a grade of zero for that experiment. Please note that you MUST be on time for every lab period. If you are more than 15 minutes late for lab you will miss important safety information and may thus not be allowed to complete the experiment. This will count as your one excused absence for the semester and must be arranged with your instructor.

No make-up laboratories will be given. This is in accordance with the chemistry department's policy.

Accommodating Disabilities:
Lehman College is committed to providing access to all programs and curricula to all students. Students with disabilities who may need classroom accommodations are encouraged to register with the Office of Student Disability Services. For more information, please contact the Office of Student Disability Services, Shuster Hall, Room 238, phone number, 718-960-8441.

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Classroom Policy:

- **Food policy: FOOD** and **DRINKS** are **STRICTLY PROHIBITED** in the chemistry laboratory.
- **Electronic devices Policy:** No electronic devices can be used or kept accessible during lab quizzes; this includes, but is not limited to i-Phones, smart watches, google glasses, cell-phones (any type), beepers, iPods, MP3 players, tape-recorders, PDAs, and other computing or music devices. Only **basic scientific** calculators will be allowed. **Graphing Calculators are not acceptable**.
- **Required Equipment (**to be provided by the student**):** padlock; detergent; paper towels; matches.

SAFETY GLASSES MUST BE WORN AT ALL TIMES IN LABORATORY! Students without **SAFETY GLASSES will be not allowed to work in the laboratory.**

Academic Integrity:
See the Lehman Undergraduate Bulletin.

Lehman College FALL 2018

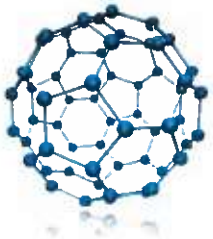
Essentials of Organic Chemistry (CHE 120)

Instructor: Ben Burton-Pye **Email**: benjamin.burtonpye@lehman.cuny.edu

Office: 322 Davis **Office Hours**: Fridays 1 -2:30 pm

Course description: Organic chemistry can be experienced in many aspects of your everyday life. From the fuel used to power our transportation to the soap you use to wash, from the food we eat, to the medicines we take, organic molecules have many fascinating properties that we can use in many different ways!

'Essentials of Organic Chemistry' is a course designed for non-chemistry major students. This one-semester course covers many of the fundamental aspects of Organic Chemistry, without going into the depth required for a chemistry major. This includes basic concepts such as structure, bonding, stereochemistry, reactions and nomenclature. The course will also introduce some biologically relevant molecules, however will not cover biochemical processes. The material covered in this course will provide a solid foundation for those going into health science and non-chemistry careers.



Many of the concepts covered in this course will be new to you and may take a little time to 'click'. The material is challenging and familiarity will help you succeed in CHE 120. We recommend that you spend **at least 10-15 hours per week** studying and completing the coursework to be proficient in the subject. Any extra reading or investigation into the material will add to this time commitment.

Pre-requisite: Essentials of General Chemistry (CHE 114 or equivalent)

Course Materials

Recommended textbook:
Chemistry: General, Organic and Biological Structures of Life. (Karen C. Timberlake). ISBN: 0321750128. ISBN13: 9780321750129

Sapling website access code: Available in the Lehman College Bookstore.

iClicker personal response device: Available from the Lehman College Bookstore.

Web Site: As part of the course we will be using BlackBoard 9.1. Instructions on how to access the course website on blackboard can be found at: http://www.lehman.edu/itr/blackboard.php

In addition to course information, lecture notes, exam feedback, I will also periodically post announcements and additional resources on blackboard. This will be the main way I will communicate with you about the course outside of our in-class time; it is vital that you check your blackboard on a regular basis. Copies of announcements will be sent to your **@lc.cuny.edu address** (or the address associated with your BB account). Please make sure that you can access both.

Required Homework: This semester we will be using an on-line homework system called Sapling. You will need to buy an access code through the bookstore and register for our course in order to access and complete your Sapling assignments. **Sapling will be available on Tuesday, February 2nd.** If this is your first time registering for Sapling for CHE 120 you are entitled to a 14 day free trial (from Feb 2nd).

To register for Sapling:

1. Log on to https://www.saplinglearning.com/ibiscms/login/
2. Click on the blue "create an account" tab and follow the online instructions to create a user profile (choose a username and password).
3. Select **CUNY, Lehman College** as your school
4. Select **CUNY Lehman - Chem 120 – Spring 16 – Burton-Pye** as your course.
5. Follow the online instructions to apply your Access Code or to choose the Free 2-week trial option

The homework is an important part of this course – it helps you to become familiar with the material and greatly helps you to prepare for exams! Typically there will be two homework assignments due each Monday Evening. There are enough questions to provide for 'extra credit' in each assignment – do as much of the homework as you can to maximize your score and your overall grade.

Required iClicker:

As part of this course we will be making use of a personal response device called an iClicker. You will use the iClicker to respond to in-class questions during each lecture. This will serve a dual purpose: 1) Your responses will provide me with real-time feedback about student understanding of course content and 2) Your responses will serve as evidence of attendance for each lecture. iClicker questions will count for a total of 200 points towards your final grade. To earn iClicker points you must respond to at least 75% of the iClicker questions for each lecture. You will be allowed 4 free passes over the course of the semester to account for when your iClicker malfunctions or when you forget it at home.

iClickers can be purchased at the Lehman College Bookstore. If you already own an iClicker from a previous course it can be used again for this course! Once you have your iClicker you will need to register it (even if you already registered it in a previous semester). *To register your iClicker:*

Log on to https://www1.iclicker.com/register-clicker/

Complete the registration questions. **Note:** You must register using your full first and last name and your Lehman College Blackboard ID number. Your blackboard number will be used to link your iClicker responses to our online student roster.

To find your Lehman College BlackBoard (bb9) number:

1. Log on to BlackBoard
2. Click on the "Personal Information" tab on the top left side of the screen in the "Tools" panel.
3. Click on the "Edit personal Information" tab.
4. Here you will find your username followed by a 20-digit number. This 20-digit number is your Lehman College bb9 number. Copy and Paste this number into the iClicker Registration page.

Attendance Policy:
The attendance to the lecture is compulsory. While attendance will not be monitored every week you cannot be successful in this course if you do not attend the lectures.

Grading policy: Every component of CHE 120 earns you points to your final grade. You must complete each component by its due date to earn the points.
The overall grade for the course is determined from a raw total of *1400* points. The point distribution is as follows:

Component	Points
Homework	200
iClicker	200
Exam 1	200
Exam 2	200
Exam 3	200
Final	400

The total number of points that you earn will be normalized to a score out of 100.00 and then be assigned to a letter grade. The *tentative* grade breakdown is shown in the following table. Grades will be assigned to a score based on 2 decimal places. Grades will not be assigned on rounded scores.

Letter Grade	Course Requirement (%)
A	92.50
A-	90.00
B+	87.50
B	82.50
B-	80.00
C+	77.50
C	70.00
D	60.00
F	<60

Homework: You have to accumulate 200 points to receive full credit for the homework. There will be enough extra credit to provide opportunities to maximize your homework score.

Exams: There will be three equally weighted in-class exams given during the semester (3 exams worth 200 points each totaling 600 points). There will also be a comprehensive final exam given during finals week worth 400 points. If your final exam grade is higher than your lowest in-class exam grade, the final will count for 600 points and the lowest in-class exam grade dropped.

Academic Dishonesty: Lehman College regards acts of academic dishonesty (e.g., plagiarism, cheating on examinations, obtaining unfair advantage, and falsification of records and official documents) as serious offenses against the values of intellectual honesty. The college is committed to enforcing the CUNY Policy on Academic Integrity and will pursue cases of academic dishonesty according to the Lehman College Academic Integrity Procedures.

All cases of academic dishonesty will be reported to the College.

Accommodating Disabilities:
Lehman College is committed to providing access to all programs and curricula to all students. Students with disabilities who may need classroom accommodations are encouraged to register with the Office of Student Disability Services. For more information, please contact the Office of Student Disability Services, Shuster Hall, Room 238, phone number, 718-960-8441.

The Science Learning Center (SLC):
The Science Learning Center (SLC) is the tutoring center on campus. The SLC provides drop-in tutoring for natural and computer science courses. To obtain more information about the SLC, please visit their website at http://www.lehman.edu/issp, or please call the ACE at 718-960-8175.

Tips for success in CHE 120

Review materials in the book before class. Familiarity helps a lot with organic chemistry.

Review your notes after class and the relevant chapters covered.

Practice, practice, practice – use the problems in the book and on sapling between lectures for extra practice

Ask for help as soon as you can! See your instructor during office hours while the concept you are having trouble with is fresh in your mind. Bring any attempted problems with you, along with your answers.

Staying on top of the material is paramount. Do not fall behind.

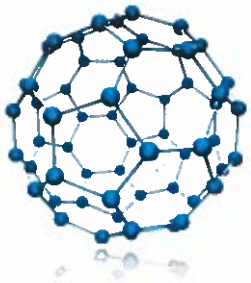
Essentials of Organic Chemistry: *Tentative* Spring 2016 Pacing Guide *(Chapters based on Timberlake 4th Ed)*

Week	Mon Date	Chapters	Tuesday		Thursday		To do by Monday
			In Class	To start at Home	In Class	To start at Home	Due Date
1	1-Feb	11	Introduction/Sections 11.1 - 11.2	Sapling assignment 1	Section 11.3	Sapling assignment 2	Assignments 1 & 2
2	8-Feb	11	**No Class - Tuesday follows a Friday Schedule**		Sections 11.4 - 11.5	Sapling assignment 3	Assignment 3
3	15-Feb	12	Sections 12.1 - 12.2	Sapling assignment 4	Section 12.3	Sapling assignment 5	Assignments 4 & 5
4	22-Feb	12 & 13	Sections 12.4 - 12.5	Sapling assignment 6	Sections 13.1 - 13.2	Sapling assignment 7	Assignments 6 &7
5	29-Feb	13	Section 13.3 - 13.4	Sapling assignment 8	**Review**		Assignment 8
6	7-Mar	Exam 1 & 14	**Exam 1**		Sections 14.1 - 14.3	Sapling assignment 9	Assignment 9
			Exam 1 will be on Tuesday 8th March and will cover chapters 11, 12 and 13				
7	14-Mar	14 & 16	Sections 14.4 - 14.5	Sapling assignment 10	Sections 16.1 - 16.2	Sapling assignment 11	Assignments 10 & 11
8	21-Mar	16 & 18	Sections 16.3 - 16.4	Sapling assignment 12	Sections 18.1 - 18.3	Sapling assignment 13	Assignments 12 & 13
9	28-Mar	18	Sections 18.4 - 18.6	Sapling assignment 14	**Review**		Assignment 14
10	4-Apr	Exam 2 & 19	**Exam 2**		Sections 19.1 - 19.3	Sapling assignment 15	Assignment 15
			Exam 2 will be on Tuesday 5th April and will cover chapters 14, 16 and 18				
11	11-Apr	19 & 17	Sections 19.4 - 19.6	Sapling assignment 16	Sections 17.1 - 17.2	Sapling assignment 17	Assignments 16 & 17
12	18-Apr	17	Sections 17.3 - 17.4	Sapling assignment 18	Sections 17.5 - 17.7	Sapling assignment 19	Assignments 18 & 19
13	25-Apr		**Spring Break!**		**Spring Break!**		
14	2-May	15	Sections 15.1 - 15.3	Sapling assignment 20	Section 15.4 - 15.6	Sapling assignment 21	Assignments 20 & 21
15	9-May	Exam 3	**Review**		**Exam 3**		-
			Exam 3 will be on Thursday 12th May and will cover chapters 19, 17 and 15				
16	16-May		**Final Review**		**Reading Day**		-
17	23-May	Final	**26th May at 8:30 am and will cover chapters 11 - 19**				

Essentials of Organic Chemistry: *Tentative* Spring 2016 Pacing Guide *(Chapters based on Timberlake 4th Ed)*

Lesson content overview

Week	Mon Date	Chapters	Tuesday		Thursday		To do by Monday Due Date
			In Class	To start at Home	In Class	To start at Home	
1	1-Feb	11	About the class Introduction to organic compounds	Sapling assignment 1	Alkanes and alkanes with substituents	Sapling assignment 2	Assignments 1 & 2
2	8-Feb	11	**No Class - Tuesday follows a Friday Schedule**		Properties of alkanes and introduction to functional groups	Sapling assignment 3	Assignment 3
3	15-Feb	12	Alkenes & alkynes | Cis-trans isomers	Sapling assignment 4	Addition reactions	Sapling assignment 5	Assignments 4 & 5
4	22-Feb	12 & 13	Polymers of alkenes | Aromatic compounds	Sapling assignment 6	Alcohols, phenols, thiols and ethers	Sapling assignment 7	Assignments 6 &7
5	29-Feb	13	Physical properties of alcohols, phenols and ethers | Reactions of alcohols and thiols	Sapling assignment 8	**Review**		Assignment 8
6	7-Mar	Exam 1 & 14	**Exam 1**		Aldehydes & ketones, their physical properties and redox reactions	Sapling assignment 9	Assignment 9
			Exam 1 will be on Tuesday 8th March and will cover chapters 11, 12 and 13				
7	14-Mar	14 & 16	Acetals & hemiacetals and introduction to chiral molecules	Sapling assignment 10	Carboxylic acids and their properties	Sapling assignment 11	Assignments 10 & 11
8	21-Mar	16 & 18	Esters and their properties | hydrolysis reactions and formation	Sapling assignment 12	Amines and their properties | introduction to heterocycles	Sapling assignment 13	Assignments 12 & 13
9	28-Mar	18	Amides and their properties | hydrolysiss of amides	Sapling assignment 14	**Review**		Assignment 14
10	4-Apr	Exam 2 & 19	**Exam 2**		Amino acids, their zwitterions and formation of peptides	Sapling assignment 15	Assignment 15
			Exam 2 will be on Tuesday 5th April and will cover chapters 14, 16 and 18				
11	11-Apr	19 & 17	Proteins: Levels of structure and their hydrolysis and denaturation	Sapling assignment 16	Lipids and fatty acids	Sapling assignment 17	Assignments 16 & 17
12	18-Apr	17	Waxes & triacylglycerols: their properties, hydrogenation and hydrolysis reactions	Sapling assignment 18	Phospholipids, steroids and cell membranes	Sapling assignment 19	Assignments 18 & 19
13	25-Apr		**Spring Break!**		**Spring Break!**		
14	2-May	15	Carbohydrates and Fisher & Haworth projections	Sapling assignment 20	Chemical properties of mono, di- and poly saccharides	Sapling assignment 21	Assignments 20 & 21
15	9-May	Exam 3	**Review**		**Exam 3**		
			Exam 3 will be on Thursday 12th May and will cover chapters 19, 17 and 15				
16	16-May		**Final Review**		**Reading Day**		
17	23-May	Final	**26th May at 8:30 am and will cover all topics**				



Lehman College
City University of New York
Department of Chemistry

Essentials of Organic Chemistry Laboratory
CHE 121
Spring 2019

Instructor: **Dr. Radhashree Maitra**
Email: radhashree.maitra@Lehman.cuny.edu Cell: (718)8011359
Office Hours: Thursday 11:00 a.m. -12 noon (pls email for appointment)

Course Description: CHE 121: Essentials of Organic Chemistry Laboratory

- One laboratory of 3 hours per week / 1.5 credits.
- Introduction to laboratory experimentation to familiarize students with basic synthesis and analysis of organic molecules

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Prerequisite: CHE 115 & 120 | **co-requisite:** CHE 120

Place of course in degree program:
This laboratory is a requirement for various Health Sciences programs.

Academic or Learning Objectives:
Student Learning Outcomes: After completing this laboratory students should be able:

- - Understand the structure of organic molecules
- - Use qualitative chemical tests and theory to solve problems
- - Perform and identify basic organic reactions
- - Effectively record data and observations to be able to solve problems

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Required Readings:
Essentials of Organic Chemistry – Custom Edition for Lehman College. Karen C. Timberlake. (ISBN-13: 978-1-323-72182-7) Boston 2018
The lab manual is available only in the Lehman College book store with a molecular modeling kit as one package.
Other Materials:
1 Padlock

Attendance Policy:
The attendance to the laboratory is compulsory. **No make-up laboratories will be given. A student cannot miss more than TWO laboratories.** A student will not receive a passing grade if more than two laboratories are missed.

Course Requirements and Grading:
A student's grade in the CHE 121 class will be determined from a combination of grades given for laboratory reports and grades obtained from attendance to the laboratory. Each laboratory report will be graded from 0 to 20. **The student's laboratory report grade will be determined by dropping the lowest grade of the eleven laboratory reports and averaging the remaining grades**. The student's final grade will be calculated by summing 90% of the laboratory report average with 10% of the attendance average. In the event a student is absent, a grade of zero will be earned. This zero can then be counted as one of the dropped grades for a laboratory report. Lateness will be defined as arriving 35 minutes after the beginning of the scheduled laboratory time. Showing up on time and wearing the appropriate safety equipment is essential for you to be able to complete the lab and receive the points! Please do not be late! ***Laboratory reports have to be completed and submitted to the instructor by the end of the laboratory period.***

While attendance is compulsory all students MUST attend and complete the checkout day in order to receive attendance credit for the entire semester.

F and WU policy:
If a student stops attending before the end of the semester and does not come to the checkout session in week 14, a **WU** will be awarded. A grade of **F** will be awarded if a student misses more than 2 lab sessions and attends the check out in week 14.

Accommodating Disabilities:
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Classroom Policy:

- **SAFETY GLASSES** MUST BE WORN AT ALL TIMES IN LABORATORY! Students without **SAFETY GLASSES will be not allowed to work in the laboratory.**

- **Food policy: FOOD** and **DRINKS** are **STRICTLY PROHIBITED** in the chemistry laboratory.

- **Required Equipment (to be provided by the student):** padlock; detergent; paper towels

- Upon arrival to the laboratory the pre-laboratory (*Pre-Lab Study Questions*) will be graded (2 points out of 20 total points). In order to receive these points you have to

    1. Hand the prelab to your instructor as soon as you enter the laboratory: **ZERO POINTS WILL BE GIVEN IF YOU DON'T SUBMIT THE PRE-LAB AT THAT MOMENT.**
    2. Be on time! **STUDENTS ARRIVING LATE CAN ONLY EARN HALF OF THE PRE-LAB SCORE**
    3. Wear safety glasses for the entire time you are in the laboratory. The lab has a 3-strike policy regarding safety glasses: **If your instructor has to tell you to wear your safety glasses 3 times you will only earn half of the Pre-lab score. !!PLEASE WEAR YOUR SAFETY GLASSES!!**

- During the first 15-35 minutes of the laboratory a lecture will be given related to the experiment to be done that day. If you miss the lecture, you will not be allowed to do the experiment. **THERE IS NO LABORATORY MAKE-UP.**

- The experiment will be performed in pairs. The laboratory reports (*Report Sheets* from your laboratory manual) will be submitted individually at the end of the laboratory period.

Academic Integrity:
See the Lehman Undergraduate Bulletin.

Lehman College
City University of New York
Department of Chemistry

Course topics:
The following topics will be covered:
Molecular geometry and structure, Addition reactions, Esterification Reactions, Chromatography, Polymerization, Reduction and Oxidation reactions, Hydrolysis reactions, Properties of biologically relevant molecules

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CHE 121 Essentials of Organic Chemistry Laboratory

2019 Spring Semester

Please Note: This schedule is subject to minor change so that course material can be best presented.
All reading and pre-lab assignments are to be completed before class.

EXPERIMENTS

Week Number	Page Numbers	Experiment Title
1	1-8	Safety, Check in, Waste Disposal
2	9-24	Organic Compounds: Alkanes (A*, B, & C) **Bring your modelling kit!**
3	25-30	Reactions of Unsaturated Hydrocarbons (A, B, C, & D) **Bring your modelling kit!**
4	31-40	Aspirin and other Analgesics: A – Preparation of Aspirin
5	31-40	Aspirin and other Analgesics: B & C
6	41-50	Plastics and Polymerization: D – Preparation of Nylon
7	*Handouts*	*Functional groups and identification of unknowns: Alcohols and carbonyl compounds*
8	59-68	Tests for carbohydrates (A, B, C & D)
9	69-76	Saponification and Soaps (A & B)
10	77-84	Amino Acids: (A & B) **Bring your modelling kit!**
11	85-94	Peptides and Proteins (C, D, & E)
12	*Handouts*	*Enzymes*
13	95-104	Vitamins (A & B)
14		Check out

Lehman College
City University of New York
Department of Chemistry

Important information for Week 14 – Check out

During the last week of class, students perform a 'check out' procedure. This must be completed in order to receive the attendance score for the course.

1. Remove everything from the drawer.
2. Clean the drawer and re-line it with clean paper towels.
3. Inventory equipment:
   a. Take excess equipment to the stockroom (excess equipment must be **LABEL FREE, CLEAN**, and **DRY**).
   b. Replace any missing items from the stockroom.
4. Be sure all glassware is **CLEAN, DRY** and **FREE OF LABELS**.
5. Place equipment on bench in the order it is listed on the check-out sheet.
6. Ask the instructor to check your equipment.
7. When approved, place equipment in your drawer.
8. Place a college lock on the drawer.

VERY IMPORTANT NOTE

Departmental missing lab policy states that the attendance to the laboratory is compulsory. A student cannot miss more than TWO laboratories. For the case of missing more than two laboratories the student will not receive a passing grade.

What does this policy mean?

If the students stop attending the labs before the end of the semester and they never come back, they should **receive a "WU"** and NOT an "F". On the other hand, if they are there for the last lab but they missed 3, 4 or 5 labs they are getting the Fs. However, after the student missed the 3rd lab they will be informed again about this policy and it will be made clear to them that they cannot get a passing grade.

Lehman College, CUNY

General Chemistry 1: ~~Fall 2015~~ Spring 2019.

Thursday 12:00pm – 1:50pm in Gillet 024
OR Friday 1:30pm – 3:20pm in Davis Hall 319

Instructor: Professor Donna McGregor (304 Davis Hall)
Email: donna.mcgregor@lehman.cuny.edu
Office Hours: Thurs, 4-6pm in 319 Davis Hall (or by appointment)

Goal of the course: This is the first semester of a 2-semester general chemistry sequence that begins to prepare you for a science-based career. General Chemistry I is a demanding course and while its primary objective is to introduce you to the fundamental principles that underlie the chemical sciences, to achieve success in this course you will need to organize large quantities of information in coherent ways so that you are able to recall and apply your knowledge. Organization of your time will be essential!

General Chemistry is run using a flipped classroom model. In this model you will watch videos and complete online homework at home and then come to class to complete workshop assignments (during your 1 hour recitation section) and participate in peer-learning activities using an iClicker (during our 2 hour lecture every Thursday).

You should plan to spend ***at least* 10-15 hours per week** watching videos, doing your online homework, engaging with your classmates and learning the material. It is your responsibility to prepare yourself for every topic before you come to class to engage in the workshop or iClicker activities. You must keep up with the material – it is unlikely that you will be able to catch up if you fall behind.

Text: For the purposes of this course you will be required to buy the General Chemistry 1: Let's Practice Workbook from the Lehman College Bookstore. You can however, use ANY General Chemistry textbook. We will not be working through a textbook in a chapter-by-chapter fashion; rather we will cover 18 chemistry topics and use the textbook as a reference. *If you feel the need to buy a recommended textbook Chemistry, 8th Ed., Zumdahl and Zumdahl is a wonderful choice.*

Web Site: As part of this course we will be using a new platform called GenChem. The GenChem platform will be ready for account registration on **Tuesday, August 25th.** You should log on to GenChem as soon as you can and register so that you can become familiar with the look and feel of the web interface. It is imperative that when we meet on Thursday August 27th (or Friday, August 28th if you are in the Friday section) that you are already registered on the GenChem website.

To claim your GenChem account:

1. Log on to http://genchemlehman166.org **on or after August 25th .**
2. Click Register and complete the registration process by entering your blackboard ID number, a working email address and a password that you create. It is very important that you use the same email address to claim your GenChem account and register both your iClicker and your Sapling homework account. This email address must be one that you check regularly as we will use it to communicate with you via the GenChem platform.

To find your Lehman College Blackboard ID number:

1. Log on to https://cunyportal.cuny.edu/cpr/authenticate/portal_login.jsp
2. Log into your account and Click on the Blackboard Tab in the "Applications/Resources" panel.
3. Click on the "Personal Information" tab on the top left side of the screen in the "Tools" panel.
4. Click on the "Edit personal Information" tab.
5. Here you will find your username followed by a 20-digit number. This 20-digit number is your Lehman College blackboard number.

The GenChem platform will be used in lieu of CUNY Blackboard and has been designed specifically for our course. This is where you will find ALL course documents including (but not limited to) the Learning Goal Analysis (LGA), Videos, Video PDF documents, iClicker sessions, links to online Sapling homework, Workshop assignments and old general Chemistry exams.

Email: Please make sure that you use the same email address to claim your GenChem account and register both your iClicker and your Sapling homework accounts. This should be an email address that you check frequently as we will be using email through the GenChem platform to communicate with the class. If you do not check your email regularly it is possible that you will miss important information - which is likely to have a negative impact your grade.

Grading policy: Every component of this course earns you points towards your final grade, but to earn your points you must complete each component by its due date. Please see the GenChem platform for more information on assignment due dates.

To earn full credit in this course you must accumulate 1400 points. 400 points come from your TOPIC grade and 1000 points come from your EXAM grades.

TOPIC	LGA[1]	Videos[1]	Workshop	i-Clicker	Homework[2]	TOPIC TOTAL[3]	In-Class Exams[4]	Final Exam[4]
Topic 1	2	2	0	0	5	9	Exam 1 (200 pts)	400 pts
Topic 2	2	2	W1: 10	0	5	19		
Topic 3	2	2	0	C1: 11	5	20		
Topic 4	2	2	W2: 10	0	5	19		
Topic 5	2	2	0	C2: 11	5	20		
Topic 6	2	2	W3: 10	C3: 11	5	19		
Topic 7	2	2	0	0	10	14	Exam 2 (200 pts)	
Topic 8	2	2	W4: 10	C4: 11	10	35		
Topic 9	2	2	0	0	10	14		
Topic 10	2	2	W5: 10	C5: 11	10	35		
Topic 11	2	2	0	0	10	14		
Topic 12	2	2	W6: 10	C6: 11	10	35		
Topic 13	2	2	0	0	5	9		
Topic 14	2	2	W7: 10	C7: 11	10	35	Exam 3 (200 pts)	
Topic 15	2	2	W8: 10	C8: 11	10	35		
Topic 16	2	2	W9: 10	C9: 11	10	35		
Topic 17	2	2	W10: 10	0	10	24		
Topic 18	2	2	W11: 10	C10: 11	10	35		
TOTALS	**36**	**36**	**110**	**110**	**145**	**437**	**600**	**400**
Total Topic Grade Required = 400 out of a total of 437 possible points							**Total Exam Grade = 1000**	
Total number of points to be earned in the course: 400 + 1000 = 1400								

1. The points for an LGA is an all or nothing score. 2 points are earned for completion of an assignment and zero points are earned for an incomplete assignment.
2. The points for each workshop, iClicker and homework assignment are scaled to the totals indicated.
3. The total score for each topic is computed by summing the topic components. There are 437 total TOPIC points, but only the first 400 points count. Think of the extra 37 points as extra points that you can accumulate and use if you miss an assignment. You cannot earn more than 400 TOPIC points. These extra points cannot be applied to your exam score.
4. If you miss an in-class exam the final exam will count for 600 points instead of 400 points. There are NO make-up exams.

The total number of points you earn will be normalized to a score out of 100.00 and then assigned a latter grade according to the table shown to the right. Letter grades will be determined based on a score to 2 decimal places. There will be no rounding of scores to determine letter grades.

Letter Grade	Course Requirement
A+	97.50
A	92.50
A-	90.00
B+	87.50
B	82.50
B-	80.00
C+	77.50
C	70.00
D	60.00
F	<60

Exams: There will be three equally weighted in-class exams (200 points each for a total of 600 points) given during the course of the semester. There will also be a Comprehensive Final Exam (400 points) given during finals week. If your final exam grade is higher than your lowest in-class exam grade your final grade will count for 600 points and your lowest in-class exam grade will be dropped.

For your exams you will be required to bring a pencil and a calculator to class. All other materials (e.g. periodic table and/or other necessary information such as a formula sheet) will be provided for you. Exams must be taken during the designated class period. *NO MAKE-UP EXAMS will be given.* If you miss one in-class exam you will earn a grade of zero for that exam. This grade will then be dropped as your lowest in-class exam grade and your final exam grade will automatically be counted for 600 points. If you miss more than one in-class exam you will receive a grade of ZERO for the second missed exam.

Detailed Course Outline: Please see the GenChem platform for a detailed course schedule that includes all your assignments and exam dates. In addition, we have created a video table of contents to help you organize your time effectively.

Exam schedule:

- EXAM 1: **Thursday, October 1st or Friday, October 2nd**
  Think of this exam is a Chem 166 placement exam. Your score on this exam determines whether or not you have gained the knowledge required to continue in the course. If you fail this exam you should consider withdrawing from the course. If you decide to remain in the course you should meet with one of the teaching team to discuss options for success. You will need to make a drastic change to your study habits!
- EXAM 2: **Thursday, October 29th or Friday, October 30th**
  This exam is more difficult than exam 1. If you failed exam 1 and you also fail this exam you should definitely withdraw from the course. The last day to withdraw from the course is *Monday, November 9th.*
- EXAM 3: **Thursday, December 10th or Friday, December 11th**
  This is your last and most difficult in-class exam. In general student grades drop by 10% from exam 2 to exam 3 so make sure you put in enough time to prepare for this exam.
- FINAL EXAM: **Thursday, December 17th**

A Required Learning Goal Analysis (LGA): Before you begin a new topic you will be required to complete a Learning Goal Analysis on the GenChem platform. This analysis asks you to read each learning goal for that topic and assess how comfortable you feel with the content presented. There is no wrong answer to an LGA question. The goal is to help you begin accurately self-assessing your own content understanding and focus your attention on the learning goals to drive your learning. These learning goals serve as both an outline for the course and a tool to help you prepare for your exams. USE the LGA to study for your exams. Every single Exam question is based on at least 1 learning goal (although some will contain multiple learning goals). There is also an LGA document in the resources tab on GenChem – use this to review the learning goals after you have completed the LGA.

Required 1-hour Recitation Workshops: In addition to completing the videos and LGA assignments, you are responsible for submitting a weekly recitation assignment called a workshop. Workshops are to be completed in groups of 3 or 4 students and must be submitted to your recitation instructor. You may submit your workshop in person during your assigned recitation period or electronically (using the GenChem website) no later than 5:00pm every Sunday.

There are 12 required workshop assignments this semester. Each workshop is worth 10 points. You must attend the recitation section that you registered for every week in order to earn these points. If you miss a workshop you do not earn the points for that workshop. Remember that there are 35 extra points built into your topic grade so if you miss a workshop you can use 10 of these extra points to make up the loss. Please see the Workshop Grading Policy on GenChem for more Information.

During exam weeks recitation sections will be classed as "OPEN SECTION". This means that there will be no workshop due that week and recitation attendance is optional. During "OPEN SECTION" you may attend ANY workshop to ask questions or get individual help from one of the TA's.

Required iClicker: As part of this course we will be making use of a personal response device called an iClicker. You will use the iClicker to respond to in-class questions during lecture every Friday. This will serve a dual purpose: 1) Your responses will provide me with real-time feedback about student understanding of course content and 2) Your participation will help you practice the material and grow as a chemistry student.

There will be 10 required 2 hour iClicker sessions, each worth a total of 11 points. You earn 1 point for attending a session and then 1 point for every question that you answer correctly during the session. Some sessions will have only 10 questions and some will have more than 10 questions. The maximum number of points you can earn per session is 11 so only 10 correct responses will be counted for each session. If your iClicker malfunctions or when you forget it at home you will not earn the points for that session. Please do NOT ask for points if you fail to have a functioning iClicker. Once again, remember that there are 35 extra points built into your topic grade so if you do not earn the points for an iClicker session you can use 11 of these extra points to make up the loss.

iClickers can be purchased at the Lehman College Bookstore or online at: http://www.iclicker.com/ If you continue as a chemistry student you will use this iClicker again during General Chemistry II. If you already own an iClicker from a previous course it can be used again for this course. Once you have purchased your iClicker you will need to register it. *To register your iClicker:*

1. Log on to http://www.iclicker.com/dnn/Support/RegisterYouriclicker/tabid/174/Default.aspx
2. Complete the registration questions. **Note:** You must register using your full first and last name and your Lehman College Blackboard ID number. Your blackboard number will be used to link your iClicker responses to our online student roster.

Required Homework: This semester we will be using an on-line homework system called Sapling. While links to your homework will be provided in the GenChem platform, you will need to buy an access code through the Sapling Website and register for our course in order to access and complete your Sapling assignments. **Sapling will be available on Tuesday, August 25th**

To register for Sapling:

1. Log on to https://www.saplinglearning.com/ibiscms/login/
2. Click on the blue "create an account" tab and follow the online instructions to create a user profile (choose a username and password) Please make sure that you use the same email address to claim your GenChem account and register for your Sapling homework account.
3. Select **CUNY, Lehman College** as your school
4. Select **CUNY Lehman - Chem 166 - Fall 15 - McGregor** as your course.
5. Follow the online instructions to purchase an Access Code.

The cost for ONE semester of access is $47.00, and the cost for TWO semesters of access is $78.00. If you plan to take both CHE 166 and CHE 168 we suggest you buy access for TWO semesters, as we will be using Sapling again in CHE 168.

Academic Dishonesty: While honest scholarship is time-consuming and often requires hard work, it is also the primary process by which students learn to think for themselves. Faculty members must teach respect for methods of inquiry within the various disciplines and make assignments that will encourage honest scholarship; students in turn must uphold a standard of honesty within the College, thereby affirming the value and integrity of their Lehman degree.

Academic dishonesty (e.g., cheating, plagiarism, obtaining unfair advantage and falsification of records and official documents) is prohibited in The City University of New York. Penalties for academic dishonesty include academic sanctions, such as failing or otherwise reduced grades, and/or disciplinary sanctions, including suspension or expulsion.

Academic dishonesty is a serious violation of the accepted values of the College. Students who are caught cheating on an exam in this course will automatically obtain a grade of ZERO for that exam and will be reported for Academic Dishonesty. This grade of ZERO cannot be used as your lowest exam score to be dropped in the course. More information about the Lehman College Policy on Academic dishonesty can be found here: http://www.lehman.edu/undergraduate-bulletin/academicintegrity.htm

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Accommodating Disabilities: Lehman College is committed to providing access to all programs and curricula to all students. Students with disabilities who may need classroom accommodations are encouraged to register with the Office of Student Disability Services. For more information, please contact the Office of Student Disability Services, Shuster Hall Room 238, tel: 718-960-8441.

General Chemistry 1: Learning Goal Analysis

Read each learning goal and assess how comfortable you feel with the content presented. **Remember:** The goal here is to help you begin accurately self-assessing your own content understanding and learn to focus your attention on the learning goals specific to each topic

Use the Leikert scale below to choose the appropriate responses to each question:

A. I feel very confident about his learning goal. I recognize the content and know that I could answer any questions about this subject.
B. I feel pretty confident about this learning goal. I recognize the words and know that I have worked problems about this learning goal in the past. I am sure that I could answer most questions about this subject.
C. I do not feel very confident about his learning goal. I recognize the words, but am not sure that I would be able to answer the questions about this topic.
D. I do not feel at all confident about this learning goal. I do not recognize the words and am sure that I would NOT be able to answer any questions about this topic.

Topic 1: Matter, Models and Math

1	recognize that all matter is made of atoms	A	B	C	D
2	recognize that different types of atoms are called elements	A	B	C	D
3	recognize that all elements are organized on the periodic table	A	B	C	D
4	identify metals, non-metals and semi-metals on the periodic table – what are properties of metals that make them different from nonmetals	A	B	C	D
5	identify the name of the elements of the first two rows of the periodic table and attach the name to pictures	A	B	C	D
6	identify solids, liquids and gases on the periodic table	A	B	C	D
7	sketch particle pictures for solids, liquids, and gases	A	B	C	D
8	observe animations and describe the motion as translational, rotational, vibrational	A	B	C	D
9	observe animations and link the motions to the physical state of the matter (solid, liquid, gas)	A	B	C	D
10	predict how temperature changes the speed of particles	A	B	C	D
11	represent numbers using scientific notation	A	B	C	D
12	perform calculations with numbers when written in scientific notation	A	B	C	D
13	estimate orders of magnitude based on scientific notation	A	B	C	D
14	convert among the metric prefixes without being given the conversion factor	A	B	C	D
15	convert between any given set of units if given the conversion factors using proportions or dimensional analysis	A	B	C	D

Topic 2: Atoms and Orbitals

1	Draw a planetary picture of the atom and identify the component particles of an atom	A	B	C	D
2	use isotope notation to obtain the number of protons, neutrons and electrons for any atom or ion.	A	B	C	D
3	write and interpret the isotopic representation of an element.	A	B	C	D
4	use the periodic table to obtain the number of protons for a given atom or atom symbol OR given an atom name or symbol determine the number of protons.	A	B	C	D
5	articulate the principle that an atom's identity is determined by the number of protons	A	B	C	D
6	calculate the average mass number from the periodic table for any element based on isotope abundance and formula mass	A	B	C	D
7	identify the s, p, d, and f shapes of the atomic orbitals	A	B	C	D
8	break the periodic table into four distinct sections that refer to the orbital (s, p, d, f) of the valence electrons	A	B	C	D
9	write electronic configurations for any atom and its ions using the periodic table (both the long hand and noble gas configurations)	A	B	C	D
10	identify ionic charges based on the position of an element on the periodic table for atoms in Groups 1, 2, 15, 16, 17	A	B	C	D
11	Determine the magnetism (paramagnetic or diamagnetic) of any atom or ion based on its electron configuration.	A	B	C	D

Topic 3: Basic Bonding Principles

1	recognize that all bonding occurs due to electrostatic interactions between electrons and the nucleus.	A	B	C	D
2	recognize that the *name* of the electrostatic interaction is Coulombs law and that the strength of attraction between charged particles increases as the particles get closer	A	B	C	D
3	recognize that like charges repel and opposite charges attract so that atomic nuclei without electrons would repel – no ability to make molecules! Electrons are needed to mediate the nuclear repulsions.	A	B	C	D
4	identify ionic bonded compounds by the positions of the atoms on the periodic table	A	B	C	D
5	balance the ionic charges to generate chemical formula for ionic compounds	A	B	C	D
6	identify binary compounds from the chemical formula and tell if the compound is ionic or covalent	A	B	C	D
7	name binary ionic and binary covalent compounds from the chemical formula	A	B	C	D
8	write the chemical formula from the chemical name of a binary ionic or binary covalent compound	A	B	C	D
9	recognize, recall and name all polyatomic ions in table of polyatomic ions. Know the formula and the charge for each ion	A	B	C	D
10	construct and name ionic compounds that contain polyatomic ions	A	B	C	D
11	identify ionic charges based on the position of an element on the periodic table for any atom.	A	B	C	D
12	write electronic configurations for any ion using the periodic table	A	B	C	D
13	identify the number of atoms of each atom type in a given chemical formula	A	B	C	D

Topic 4: Introduction to Covalent Bonding

1	identify molecules with covalent bonds by looking at the position of the atoms on the periodic table and comparing relative electronegativities.	A	B	C	D
2	use electronegativity to predict bond polarity	A	B	C	D
3	predict the number of valence electrons for any atom or ion based on its position on the periodic table.	A	B	C	D
4	sketch electronic distribution based on Lewis structure and bond polarity	A	B	C	D
5	assess the validity of a given Lewis structure	A	B	C	D
6	draw Lewis structures for simple covalently bonded molecules using atoms from the 1st and 2nd rows of the periodic table	A	B	C	D
7	use Lewis structures to predict trends in bond length and strength	A	B	C	D

Topic 5: The Chemical Equation

1	articulate the principle of conservation of matter and how balancing equations relates to that principle	A	B	C	D
2	balance the number of atoms in a chemical reaction on the reactant and product side	A	B	C	D
3	use the balanced chemical equation to compute the numbers of atoms or molecules produced or consumed in a chemical reaction	A	B	C	D

Topic 6: Energy Considerations

1	recognize the difference between potential and kinetic energy – know a couple of examples of potential energy – namely gravitational and electrostatic	A	B	C	D
2	write a clear statement defining the chemical potential energy	A	B	C	D
3	identify endo- or exothermic reactions from the position of heat in a chemical reaction or from the signs of ΔE and/or ΔH.	A	B	C	D
4	link changes in temperature of the surroundings to change in energy of a system for endothermic and exothermic reactions.	A	B	C	D
5	state whether energy is released or required (absorbed) when a bond breaks or is formed	A	B	C	D
6	use a table of bond energies to compute the total energy change for a chemical reaction and to predict the thermicity (endo or exo) of a reaction	A	B	C	D

Topic 7: Periodic Trends

1	use Coulomb's law to describe the source of potential energy in atoms (electrostatic potential energy) and the energy of motion of the electrons. Ignore the energy of motion of the nucleus itself.	A	B	C	D
2	note that energy of the atom typically means the electrostatic potential energy and the kinetic energy of the electrons.	A	B	C	D
3	recall the definition of atomic size, electronegativity, ionization energy and electron affinity	A	B	C	D
4	recognize the periodic trends based on the periodic table for elements and their ions	A	B	C	D
5	rationalize the periodic properties of the elements and ions	A	B	C	D
6	recall and rationalize the exceptions to the ionization energy trend	A	B	C	D
7	write electron configurations for a series of isoelectronic ions	A	B	C	D
8	predict the relative sizes of isoelectronic ions	A	B	C	D
9	interpret graphs of periodic properties as a function of atomic number	A	B	C	D

Topic 8: Atomic Spectroscopy

1	use (you do not need to memorize) the Rydberg equation to calculate energy levels	A	B	C	D
2	use the Rydberg equation to calculate energy differences for specific transitions or calculate specific transitions from energy differences	A	B	C	D
3	use the relationship between wavelength and frequency to compute wavelength from frequency and vice versa for light	A	B	C	D
4	relate the color of the light to a frequency or wavelength of light	A	B	C	D
5	identify the visible region of the EM spectrum and demonstrate that visible light is a miniscule fraction of the EM spectrum	A	B	C	D
6	use the Planck equation to relate energy of the photon to its frequency or wavelength.	A	B	C	D
7	identify the low energy vs the high energy end of the EM spectrum and relate this to wavelengths and frequency.	A	B	C	D
8	recognize how the electromagnetic spectrum is used to probe atomic structure.	A	B	C	D
9	Use an atomic spectrum to compute possible energy level transitions	A	B	C	D
10	Use atomic spectrum to compute the nuclear charge	A	B	C	D
11	relate the energy level differences of an atom to the wavelength of the corresponding photon.	A	B	C	D
12	Use Rydberg equation to compute a line spectrum	A	B	C	D

Topic 9: The Electron

1	describe the failure of the classical model to explain the hydrogen atom's stability	A	B	C	D
2	describe the duality of nature – what defines a particle (mass and position), what defines a wave (diffraction and interference)	A	B	C	D
3	calculate the mass of photon and recognize the Compton Effect as the primary experiment suggestion photons have mass and are therefore particles	A	B	C	D
4	use debroglie equation to calculate wavelengths of particles and therefore realize that particles can act as waves	A	B	C	D
5	be familiar with the double slit experiment and how it is used to demonstrate wave behavior	A	B	C	D
6	recognize that the s, p, d, f orbitals are the wavefunctions of the electrons and represent electron density and positional probability	A	B	C	D
7	relate the quantum number *l* to the orbital subshell notation (*s, p, d, f*).	A	B	C	D
8	recognize and determine the allowed quantum numbers for the n, l, m_l numbers	A	B	C	D
9	Identify the s, p, d, f block on the periodic table and use that to predict some quantum numbers (but not all – why not?)	A	B	C	D
10	interpret radial distributions of electrons—relate radial nodes to relate the radial picture to "3d" or angular pictures	A	B	C	D
11	identify the correct number of angular nodes for *s, p and d* orbitals	A	B	C	D
12	recognize the resulting electronic density from superimposed orbitals	A	B	C	D
13	relate radial distribution curves to energy level diagrams	A	B	C	D

Topic 10: Molecular Geometry

1	recognize that bond formation results in a lowering of energy	A	B	C	D
2	predict if a bond is a polar from the table of electronegativities	A	B	C	D
3	predict whether a molecule with a given shape has a dipole moment based on adding (pictorially) individual bond dipole moments or symmetry	A	B	C	D
4	looking at a picture, determine whether or not a molecule has a dipole moment or knowing the dipole moment, predict how the electrostatic potential might look	A	B	C	D
5	draw resonance structures for appropriate molecules	A	B	C	D
6	recognize that the bonding in resonance structures produces a non-integer bond order	A	B	C	D
7	calculate formal charges for each atom from a Lewis structure	A	B	C	D
8	evaluate resonance structures and determine the hybrid structure	A	B	C	D
9	relate bond length, bond strength, and bond order to particular resonance structures	A	B	C	D
10	draw Lewis structures for molecules that are exceptions to the octet rule	A	B	C	D
11	predict and name the electron geometries and corresponding bond angles for covalent molecules using VSEPR	A	B	C	D
12	predict molecular shapes from its name and/or chemical formula using Lewis structures and VSEPR rules	A	B	C	D

Topic 11: Valence Bond Theory

1	recognize sp, sp^2, sp^3, dsp^3, d^2sp^3 hybridization	A	B	C	D
2	state the hybridization of carbon's atomic orbitals when given a valid Lewis structure	A	B	C	D
3	recognize sigma and pi bonds and relate those to bond order	A	B	C	D
4	sketch sigma and pi bonds from the overlap of hybrid orbitals	A	B	C	D
5	explain why there is rotation around a single bond but not multiple bonds	A	B	C	D

Topic 12: Molecular Orbital Theory

1	draw the resulting bonding and anti-bonding orbitals when: • Two s orbitals overlap • Two p orbitals overlap head-on • Two p orbitals overlap sideways	A	B	C	D
2	distinguish among sigma (σ), pi (π), σ*, and π* (bonding and anti-bonding) orbitals in molecular orbital theory	A	B	C	D
3	identify nodes in a molecular orbital	A	B	C	D
4	given an energy diagram, predict observable properties like bond order, magnetism, bond length, and electron density	A	B	C	D

Topic 13: The Mole

1	recall and apply the basic rules of scientific notation, rounding, metric units and dimensional analysis	A	B	C	D
2	rearrange a basic algebraic expression to isolate any variable in the expression (i.e. mass = moles x molar mass)	A	B	C	D
3	revisit balancing a chemical equation and use the coefficients to predict the number of *atoms or molecules* produced or used in a chemical reaction	A	B	C	D
4	articulate that the atomic mass in the periodic table is the number of grams in a mole of the element. Alternatively the atomic mass in the periodic table is the number of grams in an Avogadro's number of atoms	A	B	C	D
5	memorize Avogadro's number: 6.023×10^{23} particles/mol	A	B	C	D
6	use the periodic table to determine the mass (in grams) of a given mole of different substances	A	B	C	D
7	interpret the chemical formula to be able to compute the molar mass	A	B	C	D
8	convert between moles and masses for an arbitrary amount of matter	A	B	C	D
9	convert between numbers of particles, moles and grams	A	B	C	D
10	scale up the coefficients to realize that they can refer to the number of atoms and molecules or even to the number of moles	A	B	C	D
11	balance chemical equations and recognize that coefficients can represent mole numbers	A	B	C	D

Topic 14: Stoichiometry Calculations

1	identify the limiting and excess reagents in a chemical reaction based on given amounts of reactants	A	B	C	D
2	use the chemical equation to compute the maximum amount (theoretical yield) of products produced	A	B	C	D
3	use the chemical equation to compute the amount of reactants needed to produce a 100% yield	A	B	C	D
4	use the chemical equation to predict all masses of all components after a reaction has run to 100% completion: i.e. amount of reactant reacted, amount of reactant unreacted (excess), amount of product produced	A	B	C	D
5	recognize the actual yield in a chemical reaction based on the wording of a problem	A	B	C	D
6	compute percent yields for any chemical reaction from actual yields and theoretical yields	A	B	C	D
7	incorporate limiting reagent calculations into *all* stoichiometric calculations starting with given amounts of reactants or given amounts of products	A	B	C	D
8	for any given set of conditions compute the amount of reactants and products in the reaction vessel (including mole, mass, % yield and or number of particles)	A	B	C	D

Topic 15: Empirical and Molecular Formula

1	compute % composition for any element based on the chemical formula of a compound	A	B	C	D
2	obtain the empirical formula from mass measurements, % composition and chemical reactions	A	B	C	D
3	obtain molecular formulas from empirical formulas and molecular weight data	A	B	C	D
4	determine empirical and molecular formula from combustion reactions	A	B	C	D

Topic 16: Phase Change and IMF

1	be able to draw particle diagrams that distinguish gas and liquid phases; be able to describe the motion in the phases	A	B	C	D
2	identify the 6 phase transitions (evaporation, condensation, freezing, melting, sublimation, deposition)	A	B	C	D
3	identify the different phases and phase transitions on a heating curve and phase diagram	A	B	C	D
4	recognize the phase transitions that require the most energy	A	B	C	D
5	interpret a phase diagram and identify the normal boiling point and normal freezing point, the triple point, and the vapor pressure at different temperatures	A	B	C	D
6	recognize that heat and temperature are different concepts; that temperature is a measure of kinetic energy of the particles and heat is a type of transfer of energy from one body to another	A	B	C	D
7	define vapor pressure and the trends in vapor pressure as a function of temperature	A	B	C	D
8	draw a particle diagram representing vapor pressure	A	B	C	D
9	define the normal boiling point in terms of vapor pressure	A	B	C	D
10	describe the difference between intermolecular forces and intramolecular forces	A	B	C	D
11	describe the following 3 intermolecular forces (IMF) and rank their relative strengths	A	B	C	D
12	london dispersion, dipole-dipole and hydrogen bonding	A	B	C	D
13	recognize and predict IMF present in a substance when given its name or chemical structure	A	B	C	D

Topic 17: Gases

1	list the ideal gas postulates and relate them to the motion of gas molecules	A	B	C	D
2	identify the four variables used to characterize a gas quantitatively (P, T, V and n)	A	B	C	D
3	describe pressure as an average Force/Area	A	B	C	D
4	recognize when the average force increases due to momentum changes or frequency changes	A	B	C	D
5	realize that the pressure of a gas is proportional to the mole number of the gas (at constant P,T,V) thus gas pressure can be used in place of mole in stoichiometry calculations.	A	B	C	D
6	assign the proper units to each of the variables: expressing P in atm, n in moles, T in Kelvin, and V in liters and use R = 0.0821 Latm/mol K	A	B	C	D
7	convert among units of V (milliliter, liter, cm^3); units of P (torr, atm, kPa); and units of T (C and K)	A	B	C	D
8	write down the ideal gas law and use algebra to rearrange PV=nRT to isolate each variable.	A	B	C	D
9	identify problems as single state and then set up the single state equation with one variable	A	B	C	D
10	identify problems as two state problems and then can find the variables that are changing and those that are not changing	A	B	C	D
11	modify the single state equation to explicitly solve for density, mass, or molar mass	A	B	C	D
12	solve the double state problem for an unknown and for relative changes in volume and pressure	A	B	C	D
13	relate the speeds of the particles to their kinetic energy and use a graph to show that different particles have different energies at one temperature	A	B	C	D
14	remember and write down the relationship between PV and KE and between T and KE	A	B	C	D
15	use the PV and KE equations to relate speed and mass (and molar mass) to temperature	A	B	C	D
16	predict relative average speeds and relative diffusion rates of gaseous particles	A	B	C	D
17	predict relative speeds of effusion and diffusion	A	B	C	D

Topic 18: Applications of Stoichiometry

1	draw particles diagrams for dissolving an ionic solid in water or for dissolving a polar covalent compound in water	A	B	C	D
2	identify the solute and the solvent in a solution	A	B	C	D
3	use molarity formula to compute mass, moles, volume, or molarity	A	B	C	D
4	use the dilution formula to compute molarity and volume after dilution	A	B	C	D
5	identify and name the 3 types of reactions: Combustion Synthesis and decomposition Precipitation/dissolution	A	B	C	D
6	predict products of combustion reactions from known oxides	A	B	C	D
7	predict products of synthesis and decomposition reactions	A	B	C	D
8	predict products of precipitation reactions using solubility rules	A	B	C	D
9	write molecular and net ionic equations for precipitation and dissolution reactions	A	B	C	D
10	demonstrate knowledge of nomenclature rules, types of reactions, and predicting products of reactions by performing stoichiometric calculations for reactions containing solids, liquids, gases, or solutions	A	B	C	D

Lehman College
City University of New York
Department of Chemistry

General Chemistry Laboratory I
CHE-167
Spring - 2019

Days, Time, Laboratory– SC - 3107

Instructor: Instructor _XXXXXXXXX -

Email: XXXXXX@lehman.cuny.edu ____

Office Hours: Day, Time in Office: __XXXXXX_

Course Description: CHE-167: General Chemistry Laboratory I

- One Laboratory of 3 hours is offered per week 3 hours / 1.5 credits.
- Introduction to the practical aspects of chemical principles, with emphasis on quantitative measurements and analytical technique.

Corequisites: CHE-166

Place of course in degree program:
This laboratory is a degree program requirement for the Chemistry, Biochemistry and Biology programs. This course is recommended for pre-medical, pre-veterinary, and pre-dental students.

Academic or Learning Objectives:
Student Learning Outcomes: After completing this laboratory students should be able:

- to make precise and accurate measurements using physical and chemical equipment and instruments.
- to use the measured data and theoretical concepts to solve problems.
- to use the mathematical and statistical analysis to assess the precision of the measurement.
- to understand the principles that govern chemical transformations, which include kinetics and equilibrium.

Required Readings:
General Chemistry Laboratory Experiments, Staff of the Department of Chemistry, Lehman College Bronx, NY (Handouts)

Lehman College
City University of New York
Department of Chemistry

Course Requirements and Grading:
A student's grade in the CHE 167 class will be determined from a combination of grades given for laboratory reports with grades obtained from quizzes. Each laboratory report and each quiz will be graded from 0 to 10. The student's laboratory report grade will be determined by dropping the two lowest grades on the thirteen laboratory reports and averaging the remaining grades. The student's quiz average will be determined by dropping the lowest grade on the four quizzes and averaging the remaining three grades. The student's final grade will be calculated by summing 70% of the laboratory report average with 30% of the quiz average. In the event a student is absent, a dropped grade for a laboratory report will be assigned for each of the absences. If a student is absent for a quiz that quiz will count for the one dropped quiz. If a student is absent more than twice they cannot receive a passing grade in accordance with the chemistry department's policy. If a student is late two times it will count as one absence. Lateness will be defined by being more than 15 minutes late for the lab.
Laboratory reports are due one week after completion. 0.1 point (out of the maximum of one ten) will be deducted for each day (or part thereof) that the report is late. The reports are received only in the day of the lab. The reports **will be not accepted anymore after two weeks from the date when those were supposed to be turned in.**

The quiz schedule is as follows:

Week Number	Quiz Number	Experiment Number	Topics to be tested on quiz
6	1	1, 2, 3, 4	Measurement, conversions & separations
9	2	5, 6, 7	Chemical reactions
12	3	8, 9, 10, 11	Qual scheme
14	4	12, 13	Empirical formula and stoichiometry

Attendance Policy:
The attendance to the laboratory is compulsory. A student cannot miss more than TWO laboratories. For the case of missing more than two laboratories the student will not receive a passing grade. **No make-up laboratories will be given. This is in accordance with the chemistry department's policy.**

Accommodating Disabilities:
Lehman College is committed to providing access to all programs and curricula to all students. Students with disabilities who may need classroom accommodations are encouraged to register with the Office of Student Disability Services. For more information, please contact the Office of Student Disability Services, Shuster Hall, Room 238, phone number, 718-960-8441.

The Science Learning Center (SLC):
The Science Learning Center (SLC) is the tutoring center on campus. The SLC provides drop-in tutoring for natural and computer science courses. To obtain more information about the SLC, please visit their website at http://www.lehman.edu/issp, or please call the ACE at 718-960-8175,

Classroom Policy:

- **Food policy: FOOD** and **DRINKS** are **STRICTLY PROHIBITED** in the chemistry laboratory.
- **Electronic devices Policy:** No electronic devices can be used or kept accessible during lab quizzes; this includes, but is not limited to i-Phones, smart watches, google glasses, cell-phones (any type), beepers, iPods, MP3 players, tape-recorders, PDAs, **bluetooth** and other computing or music devices. Only **basic scientific** calculators will be allowed. **Graphing Calculators are not acceptable**.
- **Cell Phone Policy**: Cell phones are disruptive, even in vibrate mode. Make sure your cell phones are in silent mode before class starts. Text-messaging during class is also highly disruptive (besides absolutely rude) and is forbidden. If a cell phone rings during lab, the explanation will be stopped, until the student will shut down the device and the following penalties are applicable
    - **0.5 pts penalty** if your cell phone rings while I am in class; **1 pt penalty** if you continue the disturbance (e.g., by letting it ring again); **1.5 pts penalty** for 1st ring on 2nd occasion;
- **Required Equipment (**to be provided by the student**): *padlock; detergent; paper towels.***
    - *The students should provide the padlock in the first three laboratory sessions. If the student is not providing the padlock, the stockroom will not open the drawer starting with the forth week and the laboratory will count as an absence. In the eventuality that the student is losing the key or combination of the padlock the stockroom will help the student to open the drawer and will provide a temporary padlock. This temporary padlock WILL be open next session ONLY if the student can show that he/she has a new padlock.*

SAFETY GLASSES MUST BE WORN AT ALL TIMES IN LABORATORY! Students without **SAFETY GLASSES will be not allowed to work in the laboratory**

Academic Integrity:
See the Lehman Undergraduate Bulletin.

Course topics:
The following topics will be covered:
Mass and Volume Relationships; Separation; Exothermic and Endothermic Reactions; Reactions of Copper; Chemical Reactions; Determining Solution Concentrations; Qualitative Analysis; Determination of the Formula of a Compound; Pressure – Temperature Relationship in Gases.

Homework Exercise:
Students should obtain a regular bound notebook. Before coming to the laboratory, the student should write a summary of the procedure for the day's lab experiment in the notebook. The summary should be edited after the experiment has been done and then copied onto a separate piece of paper and attached to the final laboratory report. If the laboratory contains a Pre-lab assignment, the assignment may be done before or after the laboratory experiment has been completed. The lab report for the experiment should be handed in with the pre-lab assignment and a copy of the summary at the next meeting of the class.

Lehman College
City University of New York
Department of Chemistry

CHE-167 General Chemistry Laboratory I 2019 Spring Semester
Please Note: This schedule is subject to minor change so that course material can be best presented. **All reading assignments are to be completed before class.**

EXPERIMENTS		
Week Number	**Experiment Number**	**Experiment Title**
1	1	Safety, Check in, Measurements
2	2	Measurements & Mass and Volume Relationships
3	3	Observing Chemical Changes
4	4	Separation of the Components of a Mixture
5	5	Exothermic and Endothermic
6	6	Reactions of Copper
7	7	Chemical Reactions
8	8	Determining the Concentration of a Solution
9	9	Qualitative Analysis of Cations and Cation Unknown
10	10	Qualitative Analysis of Anions and Anion Unknown
11	11	Analysis of an Unknown Salt
12	12	Determination of the Empirical Formula of Magnesium Oxide
13	13	Pressure – Temperature Relationship in Gases
14		Check out

Lehman College
City University of New York
Department of Chemistry

Spring 2019 - January 25 - May 22, 2019

Sunday Date	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1/20/2019						1	1
1/27/2019	1	1	1	1	1	2	2
2/3/2019	2	2	2	2	2	3	3
2/10/2019	3	3	~~Closed~~	3	3	4	4
2/17/2019	4	~~Closed~~	4	4	4	5	5
2/24/2019	5	4	5	5	5	6	6
3/3/2019	6	5	6	6	6	7	7
3/10/2019	7	6	7	7	7	8	8
3/17/2019	8	7	8	8	8	9	9
3/24/2019	9	8	9	9	9	10	10
3/31/2019	10	9	10	10	10	11	11
4/7/2019	11	10	11	11	11	12	12
4/14/2019	12	11	12	12	12	~~No Classes~~	~~No Classes~~
4/21/2019	~~No Classes~~	~~No Classes~~	~~No Classes~~	~~No Classes~~	~~No Classes~~	~~No Classes~~	~~No Classes~~
4/28/2019	~~No Classes~~	12	12	13	13	13	13
5/5/2019	13	13	13	14	14	14	14
5/12/2019	14	14	14	Reading Day	Final Exams	Final Exams	Final Exams
5/19/2019	Final Exams	Final Exams	Final Exams	Final Exams			

Lehman College, CUNY

General Chemistry 2: Spring ~~2018~~ 2019

Thursday 1:00pm – 2:50pm in Gillet 024

Instructor: Professor Donna McGregor (304 Davis Hall)
Email: donna.mcgregor@lehman.cuny.edu
Office Hours: TBA (or by appointment)

Goal of the course: This is the second semester of a 2-semester general chemistry sequence that begins to prepare you for a science-based career. CHE168 is a demanding course and to achieve success in this course you will need to organize large quantities of information in coherent ways so that you are able to recall and apply your knowledge. Organization of your time will be essential! And the mathematics is much more demanding than in CHE166!

Like in CHE166, we will once again be using a flipped classroom model of instruction. In this model you will watch videos and complete online homework at home and then come to class to 1) complete workshop assignments (during your 1-hour recitation section) and 2) participate in peer-learning activities using an iClicker (during our 2-hour class meeting every Thursday).

You should plan to spend ***at least* 10-15 hours per week** watching videos, doing online homework, engaging with your peers and learning material. It is your responsibility to prepare yourself for every topic before you come to class. We are here to support you in your learning, but you must keep up– it is unlikely that you will be able to catch up if you fall behind.

Text: For the purposes of this course you will be required to buy the General Chemistry 2 Let's Practice Workbook from the Lehman College Bookstore. You are not required to purchase a textbook. There is an e-book as part of your Sapling Homework (see below) but you should feel free to use ANY General Chemistry textbook. We will not be working through a textbook in a chapter-by-chapter fashion; rather we will cover 16 Chemistry topics and use the textbook as a reference. *If you feel the need to buy a recommended textbook Chemistry, 8th Ed., Zumdahl and Zumdahl is a wonderful choice.*

Web Site: As part of this course we will be using a new platform called GenChem. The GenChem platform will be ready for account registration on Tuesday, Jan 26th, 2016. You should log on to GenChem as soon as you can and register your account so that you can become familiar with the look and feel of the web interface. This is especially true if you did not complete CHE166 using the flipped model. It is imperative that when we meet on Thursday February 4th you are already registered on the GenChem platform.

To claim your GenChem account:

1. Log on to http://genchemlehman168 **on or after January 26th.**
2. Click Register and complete the registration process by entering your blackboard ID number, a working email address and a password that you create. It is very important that you use the same email address to claim your GenChem account and register both your iClicker and your Sapling homework account. This email address must be one that you check regularly as we will use it to communicate with you via the GenChem platform.

To find your Lehman College Blackboard ID number:

1. Log on to https://cunyportal.cuny.edu/cpr/authenticate/portal_login.jsp
2. Log into your account and Click on the Blackboard Tab in the "Applications/Resources" panel.
3. Click on the "Personal Information" tab on the top left side of the screen in the "Tools" panel.
4. Click on the "Edit personal Information" tab.
5. Here you will find your username followed by a 20-digit number. This 20-digit number is your Lehman College blackboard number.

The GenChem platform will be used in lieu of CUNY Blackboard and has been designed specifically for our course. This is where you will find ALL course documents including (but not limited to) the Learning Goal Analysis (LGA), Videos, Video PDF documents, iClicker sessions, links to online Sapling homework, Workshop assignments and old General Chemistry exams.

Email: Please make sure that you use the same email address to claim your GenChem account and register both your iClicker and your Sapling homework account. This should be an email address that you check frequently as we will be using email through the GenChem platform to communicate with the class. If you do not check your email regularly it is possible that you will miss important information - which is likely to have a negative impact your grade.

Grading policy: Every component of this course earns you points towards your final grade, but to earn your points you must complete each component by its due date. Please see the GenChem platform for more information on assignment due dates.

To earn full credit in this course you must accumulate 1400 points. 400 points come from your TOPIC grade and 1000 points come from your EXAM grades.

TOPIC	LGA[1]	Videos	Workshop[2]	i-Clicker[2]	Homework[2]	TOPIC TOTAL[3]	In-Class Exams[4]	Final Exam[4]
Topic 1	2	2	W1: 10	0	5	19		
Topic 2	2	2	W2: 10	11	5	30		
Topic 3	2	2	-	11	10	25	Exam 1 (200 pts)	
Topic 4	2	2	W3: 10	-	10	24		
Topic 5	2	2	-	11	10	25		
Topic 6	2	2	W4: 10	-	10	24		
Topic 7	2	2	W5: 10	11	10	35		
Topic 8	2	2	-	-	10	14		
Topic 9	2	2	W6: 10	11	10	35	Exam 2 (200 pts)	400 pts
Topic 10	2	2	-	11	10	25		
Topic 11	2	2	W7: 10	-	10	24		
Topic 12	2	2	W8: 10	11	10	35		
Topic 13	2	2	-	-	10	14		
Topic 14	2	2	W9: 10	11	10	35	Exam 3 (200 pts)	
Topic 15	2	2	W10: 10	11	10	35		
Topic 16	2	2	W11: 10	11	10	35		
TOTALS	**32**	**32**	**110**	**110**	**150**	**434**	**600**	**400**
Total Topic Grade Required = 400 out of a total of 434 possible points							**Total Exam Grade = 1000**	
Total number of points to be earned in the course: 400 + 1000 = 1400								

1. The points for an LGA is an all or nothing score. 2 points are earned for completion of an assignment and zero points are earned for an incomplete assignment.
2. The points for each workshop, iClicker and homework assignment are scaled to the totals indicated.
3. The total score for each topic is computed by summing the topic components. There are 437 total TOPIC points, but only the first 400 points count. Think of the extra 37 points as extra points that you can accumulate and use if you miss an assignment. You cannot earn more than 400 TOPIC points. These extra points cannot be applied to your exam score.
4. If you miss an in-class exam the final exam will count for 600 points instead of 400 points. There are NO make-up exams.

The total number of points you earn will be normalized to a score out of 100.00 and then assigned a latter grade according to the table shown to the right. Letter grades will be determined based on a score to 2 decimal places. There will be no rounding of scores to determine letter grades.

Letter Grade	Course Requirement
A+	97.50
A	92.50
A-	90.00
B+	87.50
B	82.50
B-	80.00
C+	77.50
C	70.00
D	60.00
F	<60

Exams: There will be three equally weighted in-class exams (200 points each for a total of 600 points) given during the course of the semester. There will also be a Comprehensive Final Exam (400 points) given during finals week. If your final exam grade is higher than your lowest in-class exam grade your final grade will count for 600 points and your lowest in-class exam grade will be dropped.

For your exams you will be required to bring a pencil and a calculator to class. All other materials (e.g. periodic table and/or other necessary information such as a formula sheet) will be provided for you. Exams must be taken during the designated class period. *NO MAKE-UP EXAMS will be given.* If you miss one in-class exam you will earn a grade of zero for that exam. This grade will then be dropped as your lowest in-class exam grade and your final exam grade will automatically be counted for 600 points. If you miss more than one in-class exam you will receive a grade of ZERO for the second missed exam.

Exam schedule:

- EXAM 1: **Thursday, March 10th**
  Think of this exam as a CHE168 placement exam. Your score determines whether or not you have gained the knowledge required to continue in the course. If you fail this exam you should consider withdrawing from the course. If you decide to remain in the course you should meet with us to discuss options for success. You will need to make a drastic change to your study habits!
- EXAM 2: **Thursday, April 7th**
  This exam is more difficult than exam 1. If you failed exam 1 and you also fail this exam you should definitely withdraw from the course. The last day to withdraw from the course is ***Monday April 11th*** and I will make sure you receive your exam 2 grades in time to make this decision.
- EXAM 3: **Thursday, May 12th**
  This is your last and most difficult in-class exam. In general student grades drop by 10% from exam 2 to exam 3 so make sure you put in enough time to prepare for this exam.
- FINAL EXAM: **TBA**

Required Learning Goal Analysis (LGA): Before you begin a new topic you will be required to complete a Learning Goal Analysis on the GenChem platform. This analysis asks you to read each learning goal for that topic and assess how comfortable you feel with the content presented. There is no wrong answer to an LGA question. The goal is to help you begin accurately self-assessing your own content understanding and focus your attention on the learning goals to drive your learning. These learning goals serve as both an outline for the course and a tool to help you prepare for your exams. USE the LGA to study for your exams. Every single Exam question is based on at least 1 learning goal (although some will contain multiple learning goals). There is also an LGA document in the resources on GenChem for your review.

Required 1-hour Recitation Workshop: In addition to completing the videos and LGA assignments, you are responsible for submitting a weekly recitation assignment called a workshop. Workshops are to be completed in groups of 3 or 4 students and must be submitted to your recitation instructor. You may submit your workshop in person during your assigned recitation period or electronically (using the GenChem website) no later than 7:00pm every Sunday.

There are 11 required workshop assignments this semester. Each workshop is worth 10 points. You must attend the recitation section that you registered for every week in order to earn these points. If you miss a workshop you do not earn the points for that workshop. Remember that there are 34 extra points built into your topic grade so if you miss a workshop you can use 10 of these extra points to make up the loss. Please see the Workshop Grading Policy on GenChem for more Information.

During exam weeks recitation sections will be classed as "OPEN SECTION". This means that there will be no workshop due that week and recitation attendance is optional. During "OPEN SECTION" you may attend ANY workshop to ask questions or get individual help from one of the TA's.

Required iClicker: As part of this course we will be making use of a personal response device called an iClicker. You will use the iClicker to respond to in-class questions during lecture every Friday. This will serve a dual purpose: 1) Your responses will provide me with real-time feedback about student understanding of course content and 2) Your participation will help you practice the material and grow as a chemistry student.

There will be 10 required 2 hour iClicker sessions, each worth a total of 11 points. You earn 1 point for attending a session and then 1 point for every question that you answer correctly during the session. Some sessions will have only 10 questions and some will have more than 10 questions. The maximum number of points you can earn per session is 11 so only 10 correct responses will be counted for each session. If your iClicker malfunctions or when you forget it at home you will not earn the points for that session. Please do NOT ask for points if you fail to have a functioning iClicker. Once again, remember that there are 34 extra points built into your topic grade so if you do not earn the points for an iClicker session you can use 11 of these extra points to make up the loss.

iClickers can be purchased at the Lehman College Bookstore. If you already own an iClicker from a previous course it can be used again for this course. Once you have your iClicker you will need to register it (even if you already registered it last semester). *To register your iClicker:*

1. Log on to http://www.iclicker.com/dnn/Support/RegisterYouriclicker/tabid/174/Default.aspx
2. Complete the registration questions. **Note:** You must register using your full first and last name and your Lehman College Blackboard ID number. Your blackboard number will be used to link your iClicker responses to our online student roster.

Required Homework: This semester we will once again be using an on-line homework system called Sapling. While links to your homework will be provided in the GenChem platform, you will need to buy an access code through the Sapling Website and register for our course in order to access and complete your Sapling assignments. **Sapling will be available for registration on Tuesday, January 26th**

To register for Sapling:

1. Log on to https://www.saplinglearning.com/ibiscms/login/
2. Click on the blue "create an account" tab and follow the online instructions to create a user profile (choose a username and password) Please make sure that you use the same email address to claim your GenChem account and register for your Sapling homework account.
3. Select **CUNY, Lehman College** as your school
4. Select **CUNY Lehman - Chem 168 – Spring 16 - McGregor** as your course.
5. Follow the online instructions to purchase an Access Code.

The cost for ONE semester of access is $47.00, and the cost for TWO semesters of access is $78.00. If you plan to take both CHE 166 and CHE 168 we suggest you buy access for TWO semesters, as we will be using Sapling again in CHE 168.

Academic Dishonesty: Lehman College regards acts of academic dishonesty (e.g., plagiarism, cheating on examinations, obtaining unfair advantage, and falsification of records and official documents) as serious offenses against the values of intellectual honesty. The college is committed to enforcing the CUNY Policy on Academic Integrity and will pursue cases of academic dishonesty according to the Lehman College Academic Integrity Procedures, see:

http://www.lehman.edu/undergraduate-bulletin/academicintegrity.htm

Students who are caught cheating on an exam in this course will automatically obtain a grade of ZERO for that exam and will be reported for Academic Dishonesty. This grade of ZERO cannot be used as your lowest exam score to be dropped in the course.

Accommodating Disabilities: Lehman College is committed to providing access to all programs and curricula to all students. Students with disabilities who may need classroom accommodations are encouraged to register with the Office of Student Disability Services. For more information, please contact the Office of Student Disability Services, Shuster Hall Room 238, tel: 718-960-8441.

General Chemistry II: Learning Goal Analysis

Read each learning goal and assess how comfortable you feel with the content presented. **Remember:** The goal here is to help you begin accurately self-assessing your own content understanding and learn to focus your attention on the learning goals specific to each topic

Use the Leikert scale below to choose the appropriate responses to each question:

A. I feel very confident about his learning goal. I recognize the content and know that I could answer any questions about this subject.
B. I feel pretty confident about this learning goal. I recognize the words and know that I have worked problems about this learning goal in the past. I am sure that I could answer most questions about this subject.
C. I do not feel very confident about his learning goal. I recognize the words, but am not sure that I would be able to answer the questions about this topic.
D. I do not feel at all confident about this learning goal. I do not recognize the words and am sure that I would NOT be able to answer any questions about this topic.

Topic 1: Equilibrium

1	Use molarity formula to determine moles, volume, and concentration	A	B	C	D
2	Use the dilution formula to compute molarity and volume after dilution	A	B	C	D
3	Write molecular and net ionic equations for any reaction when appropriate	A	B	C	D
4	Be able to write sentences or use drawings to illustrate the difference between static and dynamic equilibrium as applied to chemical systems. (Be able to include the words macroscopic and microscopic in the definitions)	A	B	C	D
5	Graph concentration vs time for all species in a stoichiometric equation	A	B	C	D
6	Use an equilibrium graph (concentration vs time) to identify the equilibrium region, to identify the stoichiometric coefficients, and to identify the reactants and products	A	B	C	D
7	Write a general equilibrium expression in terms of activity from the stoichiometric equation using the law of mass action	A	B	C	D
8	Identify the appropriate units for each species in the stoichiometric equation (molarity, atm)	A	B	C	D
9	Write expressions for K for reactions that include aqueous species, gaseous species, and solids	A	B	C	D
10	Calculate a value of K from the known equilibrium concentrations or partial pressures	A	B	C	D
11	Use PV=nRT to find any variables and relate partial pressure to moles	A	B	C	D
12	Use the value of K for a given stoichiometry equation to obtain K for the same stoichiometric relationship but written forward or backward and written with a different set of stoichiometric coefficients	A	B	C	D
13	Write expressions for K for reactions that include aqueous species, gaseous species, and solids	A	B	C	D

Topic 2: Predicting Chemical Change

1	Describe the equilibrium state of a chemical system using K if the system is at equilibrium or Q if the system is not at equilibrium	A	B	C	D
2	Obtain the value of Q from the concentrations or pressures of the species present if the system is not at equilibrium	A	B	C	D
3	Predict the direction of the shift of a reaction towards equilibrium by comparing Q to K	A	B	C	D
4	Use LeChatelier's principle to predict the shift of system that had its equilibrium perturbed. How does a reaction respond to a) an increase in mole number of one species, b) a decrease in mole number of one species, c) an increase or decrease in temperature, d) an increase or decrease in total pressure, e) an increase or decrease of reaction volume	A	B	C	D
5	Determine under what circumstances the actual value of K changes? Predict changes in K for all of the above perturbations. (In many cases K does not change – which cases?)	A	B	C	D
6	Recognize a noble gas and recognize an catalyst and realize that noble gases and catalysts do not perturb the equilibrium position	A	B	C	D

Topic 3: Acids and Base

1	dentify Arrhenius acid/base reactions	A	B	C	D
2	identify Bronsted acid/base reactions	A	B	C	D
3	identify the conjugate acids and bases in Bronsted reactions	A	B	C	D
4	define amphoteric and recognize that water is amphoteric	A	B	C	D
5	determine relative acid strength from Ka values	A	B	C	D
6	memorize and identify strong acids and bases	A	B	C	D
7	write equilibrium reactions and associate the appropriate equilibrium constant to the reaction(for acid, K_a, base K_b reactions)	A	B	C	D
8	use the pH scale to identify acidic or basic solutions	A	B	C	D
9	determine hydronium ion concentration from pH and pH from hydronium ion concentration	A	B	C	D
10	use the ICE table to solve for equilibrium concentrations for reactions with 1:1 stoichiometry	A	B	C	D
11	make appropriate approximations and use the 5% rule	A	B	C	D
12	solve the quadratic equation to obtain the equilibrium position	A	B	C	D

Topic 4: pH Calculations

1	compute pH from hydrogen ion concentration	A	B	C	D
2	compute pOH from hydroxide ion concentration	A	B	C	D
3	compute relevant concentrations from pH or pOH	A	B	C	D
4	find pH from pOH or pOH from pH based upon the K_w at 298 ($1x10^{-14}$) or other temperatures when a value for K_w is known	A	B	C	D
5	identify strong acids and bases and calculate pH (and pOH) of strong acid or base solutions	A	B	C	D
6	use ICE to compute pH and pOH of weak acid and base solutions	A	B	C	D
7	use ICE to compute concentrations of all species in weak acid and base solutions	A	B	C	D
8	recognize a salt (ionic compound) from a chemical formula	A	B	C	D
9	identify the pH active species of salt solutions	A	B	C	D
10	identify an aqueous salt solution as acidic, basic, or neutral	A	B	C	D
11	obtain Kb from Ka or Ka from Kb using Kw	A	B	C	D
12	determine pKa from Ka and pKb and Kb (or vice versa) and relate pKa or pKb values to the strength of the acid or base compound	A	B	C	D
13	calculate the pH of salt solutions	A	B	C	D

Topic 5: Polyprotic Acids and Bases

1	identify a polyprotic acid from its chemical formula and state how many acidic protons are in that compound	A	B	C	D
2	identify a polyprotic base from its chemical formula and identify the basic sites on the compound	A	B	C	D
3	link pKa1, pKa2, pKa3, etc values to the appreciate species and equilibrium reaction	A	B	C	D
4	obtain Kb1 and Kb2 values from the appropriate pKa values	A	B	C	D
5	Calculate pH and concentration of all species present in the solution for a polyprotic acid	A	B	C	D
6	Calculate pH and concentration of all species present in the solution for a polyprotic base	A	B	C	D
7	Calculate the pH for an amphoteric species	A	B	C	D

Topic 6: Buffers

1	predict products of acid-base reactions	A	B	C	D
2	predict pH of solutions obtained when strong acids are mixed with strong bases in different stoichiometric ratios	A	B	C	D
3	predict pH of solutions obtained when mixing a strong acid with a weak base or strong base with a strong acid in different stoichiometric ratios	A	B	C	D
4	recognize that buffers contain weak acids and their conjugates or weak bases and their conjugates	A	B	C	D
5	identify a solution as a buffer solution from the species present in the solution and their relative concentrations	A	B	C	D
6	calculate the pH of a buffer solution using the Henderson-Haselbach equation.	A	B	C	D
7	identify the major species of aqueous solutions and identify which solutions are buffer solutions	A	B	C	D
8	calculate the pH of the buffer solution	A	B	C	D
9	use a table of Ka and Kb values and select from the table appropriate species to construct a buffer for a desired pH	A	B	C	D
10	select the best buffer for a particular situation based upon desired pH and buffering capacity	A	B	C	D
11	describe how to prepare a buffer of given concentration and pH from strong acid and weak base (or strong base and weak acid)	A	B	C	D
12	calculate the number of moles of acid and base in a buffer based on the buffer concentration and pH	A	B	C	D
13	know difference between buffer range (pH range) and buffer capacity(moles)	A	B	C	D
14	determine buffer capacity toward added acid or base	A	B	C	D
15	use all the buffer properties to predict concentrations of all species in a buffer solution	A	B	C	D

Topic 7: Titration Curves

1	read a titration curve and identify the major species at each point on the curve.	A	B	C	D
2	identify key features of the curve including the end point, midpoint, buffering region	A	B	C	D
3	compute titrant volume required to reach the endpoint and compute pH of endpoint	A	B	C	D
4	determine the concentration of buffer species and pH at any point on the curve	A	B	C	D
5	recognize the characteristic s shape curve for strong-strong titrations and distinguish the curve from strong-weak titrations	A	B	C	D
6	recognize the buffer zone and determine the buffer range from the titration curve	A	B	C	D
7	find the pKa on a titration curve and guess the likely species based on the pKa using the table of Ka values	A	B	C	D
8	determine the buffer capacity from the titration curve for any pH in the buffer range	A	B	C	D
9	recognize a polyprotic titration curve and identify the major species in solution at any point on the curve	A	B	C	D
10	obtain major species at any pH from speciation graph	A	B	C	D
11	identify polyprotic buffer solutions from the curve and the pKa values	A	B	C	D

Topic 8: Heat and Work

1	Articulate the difference between heat and work – work is a force acting over a distance and heat is dissipative energy	A	B	C	D
2	Identify the system and surroundings for various scenarios	A	B	C	D
3	Determine if energy is leaving or entering the system and the appropriate signs for these processes	A	B	C	D
4	Identify the sign of delta H for exo or endo reactions and articulate the movement of energy in these systems	A	B	C	D
5	use tables of bond energies to compute delta H of reaction	A	B	C	D
6	State the first law and explain how it is a statement of energy conservation (recognize that negative heat and work represent a loss of energy and positive heat and work represent a gain in energy)	A	B	C	D
7	Calculate the amount of work does to or by a gaseous system	A	B	C	D
8	Recognize the appropriate signs for heat ad work of any system (including gaseous systems)	A	B	C	D
9	Compute the heat of a reaction using calorimetry at constant pressure or constant volume	A	B	C	D
10	Compute the specific heat capacity or molar heat capacity from calorimetry	A	B	C	D
11	Calculate latent for any phase transition given delta H values	A	B	C	D
12	Compute the overall heat for a system undergoing changes in both temperature and phases as read from a heating curve	A	B	C	D

Topic 9: Enthalpy

1	Enumerate the standard conditions in thermodynamics and in gases (STP) – clearly the indicate the differences	A	B	C	D
2	Recognize the relationship between energy and enthalpy	A	B	C	D
3	Use ΔH^{o} data and Hess's law to compute heats of reaction or formation	A	B	C	D
4	Relate Hess's law to the properties of a state function	A	B	C	D
5	Use Hess's law to combine the values of K for multiple reactions to find the value of K for a new reaction	A	B	C	D
6	Compute the ΔH^{o} for a reaction or ΔH^{o}_{f} from tabulated formation data and/or heats of reaction	A	B	C	D

Topic 10: Entropy

1	define spontaneity from a scientific or chemical perspective and contrast that with the more colloquial definition	A	B	C	D
2	identify the system of greater entropy and predict entropy changes of a system	A	B	C	D
3	be able to relate ΔS and ΔH of the system to ΔS of the universe	A	B	C	D
4	know that ΔS is related to ΔH only for the surroundings or only when the system is at equilibrium	A	B	C	D
5	State the 2nd law of thermodynamics and recognize that the second law is not a conservation principle	A	B	C	D
6	rationalize the temperature dependence of entropy	A	B	C	D
7	identify all standard state conditions	A	B	C	D
8	relate the existence of an absolute entropy to the third law of thermodynamics	A	B	C	D
9	Interpret entropy as a measure of disorder and recognize that entropy is a consequence of systems with large numbers of particles	A	B	C	D
10	State the 3rd law of thermodynamics and recognize that the zero point for entropy is not arbitrary	A	B	C	D
11	compute $\Delta S°$ and $\Delta H°$ from thermodynamic tables	A	B	C	D

Topic 11: Free Energy

1	predict spontaneity of chemical reactions from thermodynamic data using free energy	A	B	C	D
2	compute $\Delta G°$, $\Delta S°$, and $\Delta H°$ for chemical reactions from thermodynamic tables	A	B	C	D
3	relate ΔG for non-standard states to the standard state $\Delta G°$	A	B	C	D
4	compute ΔG using $\Delta G°$ and the reaction quotient Q for any chemical reaction	A	B	C	D
5	Use $\Delta G°=\Delta H°-T\Delta S°$ to compute ΔG and predict spontaneity.	A	B	C	D
6	relate free energy changes to the equilibrium constant (K). Calculate K from $\Delta G°$ and $\Delta G°$ from K	A	B	C	D
7	understand that equilibrium constants that were important in previous topics, such as K_w, K_a or K_b, and K_{sp}, can also be calculated from free energy values at 298K	A	B	C	D

Topic 12: Applications of Free Energy

1	understand that equilibrium constants that were important in previous topics, such as K_w, K_a or K_b, and K_{sp}, can also be calculated from free energy values at temperatures other than 298K	A	B	C	D
2	be able to estimate both normal boiling (or melting) points and boiling (or melting) points at atmospheric pressures other than 1 atm.	A	B	C	D
3	obtain equilibrium data (vapor pressure, boiling point) from thermodynamic data	A	B	C	D
4	calculate free energy changes for transport of a species from one concentration to another for both aqueous solutions and gases	A	B	C	D
5	compute thermodynamic parameters from the temperature dependence of the equilibrium constant, and conversely be able to predict the temperature dependence of K from thermodynamic parameters, including changes in vapor pressure with temperature	A	B	C	D
6	compare and/or rationalize bonding effects (ΔH) with disorder (ΔS) in solubility reactions	A	B	C	D

Topic 13: Redox Reactions

1	determine the oxidation states of atoms in molecules	A	B	C	D
2	identify oxidizing and reducing agent	A	B	C	D
3	identify oxidized species and reduced species	A	B	C	D
4	count the number of electrons transferred from the oxidized species to the reduced species	A	B	C	D
5	identify half reactions and balance redox reactions	A	B	C	D
6	compute the standard cell potentials for redox reactions	A	B	C	D
7	use the relationships between the cell potential and work to relate potentials to free energy change in redox reactions	A	B	C	D
8	predict spontaneity for these reactions	A	B	C	D
9	predict best oxidizing and reducing agents based on standard cell potentials	A	B	C	D

Topic 14: Batteries

1	draw diagrams for a galvanic cell identifying the cathode, anode, direction of electron flow, and ion flow within the salt bridge	A	B	C	D
2	sketch an "atomic" or "ionic" level diagram showing where the oxidation and reduction actually occurs	A	B	C	D
3	compute the standard cell potentials for galvanic cells and predict the spontaneous direction of galvanic cells	A	B	C	D
4	use and interpret line notation to describe a galvanic cell	A	B	C	D
5	use the Nernst equation to explore the temperature and concentration effects on galvanic cell potential	A	B	C	D
6	be able to compute cell potentials using thermodynamic data	A	B	C	D
7	draw an electrolytic cell and predict products of electrolysis	A	B	C	D
8	use q=it to compute current or time needed to plate metals	A	B	C	D

Topic 15: Chemical Kinetics

1	understand a concentration vs time plot and use this graph to identify concentrations of species at any point in time and/or instantaneous reaction rates at any point in time	A	B	C	D
2	understand the notation for reaction rates, the units for reaction rates, and be able to relate reaction rates expressed in terms of any reactant or product	A	B	C	D
3	identify the order of a reaction from a rate law and be able to compute the rate constant from the rate law and appropriate data	A	B	C	D
4	compute the rate law using the method of initial rates	A	B	C	D
5	compute the rate law for first order reactions from graphs of concentration vs time	A	B	C	D
6	obtain the value of the rate constant from appropriate graphs for first order kinetics or from a half-life for the reaction	A	B	C	D
7	use first order kinetics to obtain half lives of radioactive decay, or to obtain the rate constant from the half-life	A	B	C	D
8	use the integrated first order rate equation to calculate concentration as a function of time	A	B	C	D
9	date materials using carbon-14 or uranium-238 (understand concept and perform calculations)	A	B	C	D
10	determine the half lives of reactions having 1st order kinetics from appropriate graphs or from the rate constant	A	B	C	D

Topic 16: Arrhenius Theory

1	write rate laws corresponding to elementary reactions and simple reaction mechanisms	A	B	C	D
2	determine if a reaction mechanism is consistent with a given experimental rate law	A	B	C	D
3	use the Arrhenius equation for calculations of rate constant changes with temperature or activation energy	A	B	C	D
4	graph and interpret the Arrhenius equation	A	B	C	D
5	state the different between hetero- and homogeneous catalysts and know how a catalyst impacts the activation energy and its diagram	A	B	C	D
6	interpret and sketch reaction coordinate diagrams given appropriate information	A	B	C	D

NOTE: Topic 17 is not a required part of GenChem2, but it is interesting to look at.

Topic 17: Radioactive Decay

1	read and interpret the island of stability graph.	A	B	C	D
2	identify the types of nuclear decay and write nuclear decay equations (alpha, beta, gamma and electron capture)	A	B	C	D
3	Review first order kinetics to obtain half lives of radioactive decay, or to obtain the rate constant from the half-life (dating materials using carbon-14 or uranium-238)	A	B	C	D
4	use the relationship between mass and energy to compute nuclear binding energies	A	B	C	D
5	identify the fusion and fission processes and compute the exothermicity of fusion or fission reactions	A	B	C	D
6	understand and be able to define the terms 'chain reaction' and 'critical mass'	A	B	C	D

Lehman College
City University of New York
Department of Chemistry

CHE 169 General Chemistry Laboratory II

Instructor: Professor Marc S. Lazarus
Office Hours: Thursday, 11am – 12pm
Office Location: Davis Hall 336
Telephone: (718)960 - 8843
E-mail: marc.lazarus@lehman.cuny.edu

Course Description

CHE 169: General Chemistry Laboratory II. *3 hours, 1.5 credits*. Continuation of CHE 167. Emphasis will be on inorganic preparation, ionic separation, and qualitative analysis. PRE or COREQ: CHE 168. PREREQ: CHE 167.

Place of course in degree program

This course is a degree program requirement for the Chemistry, Biochemistry and Biology programs. This course is recommended to premedical, pre-veterinary, and pre-dental students.

Requirement Designation - Required Core - Life and Physical Sciences

Academic or Learning Objectives

Students will:

- Be able to analyze samples of unknowns using chemical reactions and separation techniques to determine which chemical species are present.
- Use experimental results and the gas laws to determine the molar volume of a gas.
- Use colligative properties to determine the molar mass of an unknown.
- Be able to determine rate laws and equilibrium constants using graphing software as applied to experimental results.
- Qualitatively interpret observations of chemical changes in terms of chemical equilibrium.
- Use the observed chemistry of acids and bases to draw conclusions and utilize the pH scale.
- Determine the solubility product and observe the common ion effect on an equilibrium involving a saturated solution of solid ionic compound.

Required Readings

Text: Lehman College Experiments, Staff, Department of Chemistry. {LC}

Grading Policy

There are twelve lab reports, each graded out of 10 points. You can drop two lab reports. In addition, there is one final exam administered on the last day of class for 30 points. The total course grade is calculated out of 130 points.

SAFETY GLASSES MUST BE WORN IN THE LABORATORY AT ALL TIMES!

Required Equipment: Padlocks, matches, paper towels and detergent

Attendance Policy

The attendance to the laboratory is compulsory. A student cannot miss more than TWO laboratories and pass the course. **No make-up laboratories will be given.**

General Chemistry II Laboratory

EXPERIMENTS		
Week	**Lab#**	**Title**
1	0 & 1	Check in and Using Graphical Analysis Program
2	2	Limiting Reagent
3	3	Calculation of an Equilibrium Constant Using Spectrophotometry I
4	3	Calculation of an Equilibrium Constant Using Spectrophotometry II
5	4	Le Chatelier's Principle and Chemical Equilibrium
6	5	Acids, Bases and pH
7	6	Volumetric Analysis of Acids and Bases
8	7	Molar Solubility, Determination of a Solubility Product and the Common Ion Effect
9	8	Determination of the Molar Volume of a Gas
10	9	Enthalpy of a Chemical Reaction
11	10	Determination of Molar Mass by Freezing Point Depression
12	11	Determination of a Rate Law
13	12	Electrical Conductivity
14	13	Check out

Experiment Schedule for Spring 2019 Semester (by Week number)

M	Week	T	Week	W	Week	Th	Week
28-Jan	1	29-Jan	1	30-Jan	1	31-Jan	1
4-Feb	2	5-Feb	2	6-Feb	2	7-Feb	2
11-Feb	3	12-Feb	CC	13-Feb	3	14-Feb	3
18-Feb	CC	19-Feb	3	20-Feb	4	21-Feb	4
25-Feb	4	26-Feb	4	27-Feb	5	28-Feb	5
4-Mar	5	5-Mar	5	6-Mar	6	7-Mar	6
11-Mar	6	12-Mar	6	13-Mar	7	14-Mar	7
18-Mar	7	19-Mar	7	20-Mar	8	21-Mar	8
25-Mar	8	26-Mar	8	27-Mar	9	28-Mar	9
1-Apr	9	2-Apr	9	3-Apr	10	4-Apr	10
8-Apr	10	9-Apr	10	10-Apr	11	11-Apr	11
15-Apr	11	16-Apr	11	17-Apr	12	18-Apr	12
22-Apr	SR	23-Apr	SR	24-Apr	SR	25-Apr	SR
29-Apr	12	30-Apr	12	1-May	13	2-May	13
6-May	13	7-May	13	8-May	14	9-May	14
13-May	14	14-May	14				
		CC=College Closed					
		SR=Spring Recess					

Organic Lecture I (CHE 232) Spring 2019

Time: Mon, Wed 4:30–5:45 pm **Location**: DA 337
Instructor: Prof. Naphtali O'Connor **Office Hours**: Thursday 10:30-11:30 am (DA 107) and by appointment
Contact Info: naphtali.oconnor@lehman.cuny.edu

Place of Course in Program

PREREQ: CHE 168. COREQ: CHE 233. 3 credits

Learning Goals

Students will utilize and learn a variety of skills which include critical thinking, quantitative reasoning and communication skills. Cooperative learning methods are employed to make students feel more comfortable in the learning environment and to develop their collaborative skills. Students also obtain a grasp of the role organic chemistry plays in life and society.

Course Objectives and Description

First semester of a 2 semester series on organic chemistry course which focuses on the methods used to identify the structure of organic molecules, organic reaction mechanisms, and methods used for the synthesis of organic compounds. Topics includes an introduction to functional groups, nomenclature, stereochemistry, substitution and addition reactions. Individuals who successfully complete this course will be able to:

- Define and employ the vocabulary of organic chemistry.
- Draw correct structural representations of organic molecules.
- Write reasonable transformations and mechanisms for alkanes, alkenes, alkynes, alkyl halides, alcohols.
- Employ stereochemical considerations when analyzing mechanisms and transformations.
- Obtain a grasp of the role organic chemistry plays in life and society.

Academic Policies and Common Misconceptions

School policy towards, grades, withdrawals and incompletes can be found in the undergraduate bulletin. To summarize:

- "The grade of W, withdrawal without penalty, is awarded only when it is clear that a student has a good and sufficient reason for withdrawing from a course and is doing so at a time when he or she is doing passing work in the course."
- "The INC grade covers any failure to complete all requirements for a course, such as submitting a paper or taking a final examination. For an instructor to grant an INC, the student must have met the instructor's attendance requirements in the course and have a passing semester average." If a student receives an INC, they will be asked to complete the missing material (example: Final Exam). They will not be allowed to sit in on the course in a later semester and poor performances erased.
- There is NO additional material or extra credit for failing students to improve their grades.
- The grading system consists of A through F. Grades are determined by your performance on the graded materials and a grade of D cannot be changed into an F.

Class Conduct and Academic Integrity

Disruptive behavior (eg. Mp3 players, use of cell phones, conversing during lecture, eating disruptive food) are not permitted. You will be asked to stop this behavior or to leave the classroom. Place your cellphones in **silent mode** during class. All communication with the instructor must be in a professional manner. Internet equipped devices (cellphones, smart watches etc) must be turned off or on airplane mode and cannot be on your person during exams. If you are caught with an internet equipped device **on your person during the exam,** your exam will immediately be taken from you and reported as cheating.

For the college's policy towards academic integrity see the Lehman Undergraduate Bulletin. Students found cheating will be brought on charges of academic dishonesty which can result in a F in the course and even suspension or expulsion from the college. http://www.lehman.edu/lehman/about/policies_pdf/CUNYAcademicIntegrityPolicy.pdf

Required Materials and Resources

- Classroom Response and Online Homework and Online Textbook System: Tophat.com (Registration instructions on page 3)
- Organic Chemistry a Guided Inquiry; Andrei Straumanis. ISBN-10: 0-618-97412-1

BlackBoard and TopHat Resources:

- Lecture Slides
- Online video links
- Sample exams

If you are not comfortable with an online textbook and prefer a physical option, Organic Chemistry, 5th edition by Janice Gorznynski Smith (ISBN-13: 978-0078021558) is the recommended alternative.

Where you can go for help:
TA: Aanchal Tyagi (see TA for office hours, Davis 322)
Science Learning Center (Gillet Hall, 133)

Grading

The total number of points for the class is 500. A breakdown by letter grade is shown but **may be altered as needed**.

	Points	**% Grade**
Midterm Exams (2 exams)	225	45% (22.5% per exam)
Final Exam	150	30%
Homework	50	10%
Class Participation	25	5%
Recitation	50	10%

Point Score	**%Grade**	**Letter Grade**
450-500	90-100	**A**
400-445	80-89	**B**
350-395	70-79	**C**
300-345	60-69	**D**
Below 300	60	**F**

Exams: Each one-hour exam is worth 112.5 points; for a total of 225. This accounts for a total of 45% of your grade.
Final Exam: The cumulative final exam is comprised of 150 points. Unless granted by the professor there are **NO MAKE-UP EXAMS** for missed midterm exams. If an acceptable extenuating circumstance causes you to miss a midterm exam, the final may take the place of the missed exam and be 262.5 pts (52.5% of your grade). Students may be given seating assignments or moved during the exam. See above for policy on internet equipped devices during exams.
Homework: Online homework will be assigned using the Tophat.com homework system. This will be worth a total of 50 pts (10%).
Class Participation: This will be taken using the Tophat.com class participation system. This will account of 25 pts (5%) of your final grade.
Recitation: 50 pts (10%) of your grade will be determined by your attendance, participation and performance in recitations.

Important Dates

- Last day to withdraw from SPRING 2019 classes with a grade of "W" — Monday April 1
- Lincoln's Birthday, college closed — Tuesday February 12
- President's Day, college closed — Monday February 18
- Classes follow a Monday Schedule — Tuesday February 20
- Spring Recess — April 19 – April 28
- Last day of SPRING 2019 classes — Tuesday May 14

Exam and Quiz Dates

Midterm Exam 1	Wednesday, February 27
Midterm Exam 2	Monday April 1
Final Exam	Monday May 21 3:45-5:45pm

Registering and using Tophat

You will be using your own device to give electronic responses into the classroom response system. These devices can be cellphones, laptop computers or tablets. You have the option of downloading an app onto your smartphone. You must also register to do this. To register, you need this information:

1. The 6-digit course code: 337289
2. The password: CHE232_Sp2019

Create an Account

1. Go to http://app.tophat.com/e/337289 to access the class directly (preferred) or to tophat.com and use 337289 as the course code.
2. Click to create an account (link may be at the bottom).

Enroll in this Class

1. Select this course to enroll, "CHE 232 Spring 2019 [Organic Chemistry I]". You will also may need to enter the password "CHE232_Sp2019".
2. At this point, you will need to register/purchase your registration code.
3. Payment information will be requested at this point. Select your code choice (either 1 semester or 1-year code). The costs are:
1-semester code = $26 or 1-year code = $38
4. You will also need to purchase the online textbook ($65) which provides access to the online homework system.
5. There is an addition $10 for Tophat test which we will be using this semester.

Course Schedule and Readings

Chapter	**Topics**	**Sections**
Chp 1	Structure and Bonding Chp 1 *(some of this material covered in general chem and will not be covered in lecture)*	1.0-1.3
Chp 4	Acids and Bases	4.0-4.3.7
Chp 2	Alkanes and an Intro to Organic Molecules	2.0-2.4, 2.9, 2.11
Chp 5	Conformations of Acyclic Alkanes and Cyclohexanes	5.0-5.9
Chp 6	Stereochemistry	6.1-6.15
Chp 3	Chemical Reactivity and Mechanisms	3.1-3.11
Chp 7 & 8	Nucleophilic Substitution	7.0-7.6 8.0-8.4
Chp 9 & 10	Alkenes: Elimination Rxns	9.1-9.5 10.1-10.3.4 11.4-11.9, 11.11
Chp 12	Alkenes: Addition Rxns	12.1-12.5, 12.7-12.11, 12.13
Chp 13	Alkynes	13.1-13.6

Organic Laboratory I (CHE 233) Fall 2018

Time: **Location**: Davis 311
Instructor:
Office Hours:
Contact Info:

Required Material:

- "*Macroscale and Microscale Organic Experiments*" Houghton Mifflin Publishing Company, 6th edition
- Laboratory Notebook
- Safety Goggles (*provided*)
- Padlock for drawer (*student provided*)
- Paper towels and liquid soap (*student provided*, often shared by students)

Learning Goals

Students will learn the ability to analyze data and form conclusions. They will utilize critical thinking to solve complex chemical problems, e.g. understanding of structure-reactivity relationships, synthetic logic, spectroscopy, problem solving. They will develop skills in recognizing hazards, minimizing risks, and safe laboratory practices. They will also develop the ability to understand physical properties of chemicals (eg. Molecular weight, acidity, polarity, electronegativity), chemical reactivity, kinetics, thermodynamics and equilibria. They well learn to perform calculations related to chemical reactions (eg. Molecular Weight, molarity, Percent Yield) and to perform various measurements. They will demonstrate the ability to communicate through the writing of lab reports. In lab reports students must exhibit the drawing of chemical structures and the description and analysis of chemical processes.

Course Objectives

The aim of the Organic Chemistry Laboratory Series is to provide you with an opportunity to learn about the synthesis, separation, purification, and identification of organic compounds. This course consists of weekly laboratory sections which involve experiments designed to help students develop the observational and critical thinking skills that are essential prerequisites for a successful career in science (or any professional field). You are expected not only to perform the experiments in the laboratory, but also to think about the principles behind the experiments.

Safety

Safety will be strictly enforced! All students must sign a safety agreement before working in lab. Students are required to follow all safety rules, **wear safety equipment (goggles)** and proper clothing (**NO open-toed shoes, shorts, miniskirts, or sleeveless tops**) at all times. Food, media devices (e.g. mp3 players) and cellphones are not permitted. Failure to follow safety rules will result in loss of points from lab score. In extreme cases expulsion from the lab section and a zero score for the week's experiment may be warranted.

Experiments

A calendar of experiments and detailed instructions on lab reports is provided on Blackboard. This calendar provides the list of experiments, reading and assignments. See the instructions for writing in your lab notebooks. Experiments should be clearly written, important data highlighted and 3-4 pages long.

Absences and Late Lab Reports

Please note the due date given for lab reports by the instructor. They are to be submitted at the start of class. Make-up labs are not allowed. Late lab reports can be penalized by up to 100% depending on how late the assignment is and the instructions you are provided.

Grading

The course grade is comprised of 2 components: Experiments and a Final Quiz.

Experiments

Lab reports are graded out of 10 pts. Grading is based upon:

1) neatness/organization and clarity of writing,
2) lab skills and performance,
3) lab preparation and cleanup,
4) tardiness,
5) analysis.

Pre-labs are checked at the beginning of every lab. The **Post-lab** write-up **must be typed**. **Lab reports** are due at the **beginning of class the next week**. If you miss a lab, it is your responsibility to turn the due lab report within the week it is due **not at the next course meeting**, otherwise points will be deducted.

Grading Rubric

	Pre-lab	*In-lab*	*Post-lab*
Presentation/Organization			
Lab Skills,Tardiness,Clean-up			
Data collection			
Analysis			

Final Quiz

The final covers all of the principles from all the experiments done during the semester.

The table below breaks down the how grades will be assigned:

Assignment Types	**# Assignments**	**Points Each**	**Total Points**	**% of Final Grade**
Lab	**12(1 report is dropped)**	**10**	**110**	**91%**
Final Quiz			**10**	**9%**

Cleanup Points: In the organic chemistry teaching labs you are expected to take care of the equipment and lab space that you use. If you fail to return equipment to their proper place or leave your area untidy, you will be deducted points.

Academic Honesty

Academic dishonesty will not be tolerated. While collaboration in lab is allowed, written lab work is an individual effort. **Copying from any portion of the written work from other students is not allowed and constitutes academic dishonesty**. For the college's policy towards academic integrity see the Lehman Undergraduate Bulletin. http://www.lehman.edu/undergraduate-bulletin/academicintegrity.htm

Lehman College of the City University of New York Department of Chemistry
Organic Chemistry Laboratory 1 (CHE 233)

Text: "Macroscale and Microscale Organic Experiments" Houghton Mifflin Publishing Company, 6th edition, 2011 ISBN-13: 978-0-538-73362-5

List of Experiments and Assignments

Meeting	Reading	Experiment
1	Chp 1 Chp 2	**I.** Check In. Lab Equipment and Glassware pp.12 (***Fig. 1.13***), **II**. Discussion of writing "The Laboratory Notebook." **III**. Discussion of Laboratory Safety and Waste Disposal chapter 2, pp. 26. **IV**. Sandbath calibration
2	Chp 3 Pp 41	**Melting Points** Determining the Melting Point pp.52 Melting Points of Pure Urea and Cinnamic Acid (experiment 2,pp.54), Melting Points of Urea-Cinnamic Acid Mixture (experiment 3, pp.54) & Unknowns(experiment 4, pp.54).
3	Chp 4 Pp 61	**Recrystallization**: Microscale Procedure for Phthallic Acid pp.79. Decolorizing a Solution With Decolorizing Charcoal (experiment 3, pp.80).
4	Chp 5 Pp 86	**Distillation:** Fractional Distillation of Cyclohexane-Toluene Mixture (experiment 2, pp.94,95)
5	Chp 6 Pp 102	**Steam Distillation**: Isolation of Citral (experiment 3, pp108-110). Please use 1/4 of the amount of the lemon grass oil, indicated in the procedure pp. 109. Use alternative steam distillation set up. Here is the only place that you use the glassware for large scale experiments.
6	Chp 8 Pp 164	**Thin-Layer Chromatography**: Analgesics (experiment 1, pp.175-7).
7	Chp 7 Pp 131	**Extraction of Caffeine from Cola Syrup** (experiment 7, microscale) pp.158-9. Drying the organic layer pp.139-140 (step 3). **Sublimation of Caffeine** (a purification method); and pp.125 (part 3), (also see Fig. 7.13 & 7.15, page 152-3) Drying agents: pp136-7, write a summary in your Lab Notebook
8	Chp 11 Pp 220	**Infrared Spectroscopy**. This chapter deals with the determination of functional groups. Write **only one page** introduction in your lab notebook. Instructor discretion for the method of presentation.
9	Chp 20 Pp 340	I. **Continuation of Week 8 Experiment IR Spectroscopy** II. **Microscale Bromination of Cholesterol** (experiment 1, microscale). pp.342.
10	Chp 17 Pp 318	**Nucleophilic Substitution** Reactions of Alkyl Halides Experiments: pp.323-5. Use only: 1-chlorobutane, 1-bromobutane, 2-chlorobutane, 2-chloro-2-methylpropane, 2-bromobutane, 1-chloro-2-methylpropane and bromobenzene (**as negative reference**).
11	Chp 19 Pp 334	**Alkenes from alcohols**: Cyclohexene from Cyclohexanol; Preparation of Cyclohexene (experiment 1, microscale) pp. 335. Follow the experiment up to the 3rd line of the last paragraph page 335, do not add toluene and follow the special handout or instruction from your instructor.
12	Chp 58 Page 680	**The Synthesis of an Alkyne from an Alkene**: meso-Stilbene Dibromide (experiment 2, microscale) pp.685 and Synthesis of Diphenylacetylene (experiment 3, microscale) pp.687.
13	Chp 9 Pp 185	**Column Chromatography**: chromatography of a Mixture of Ferrocene and acetylferrocene (experiment 4, pp.200-1). Apply and observe the separation of a 50:50 mixture following the handout procedure. For Slurry Packing Method see pp.187 and Fig. 9.1.
14		• Check out. All glassware and workspace must be clean and dry. • Final Quiz

Meeting	Experiment	Media
1	**Orientation and Check In**	• Online Safety Video #1 • Online Safety Video #2
2	**Melting Points**	I. Online Melting Pt Apparatus Tutorial II. Online Melting Pt Demo Video
3	**Recrystallization**:	I. Weighing A Solid Demo Video II. Recrystallization Demo Video III. Online Recrystallization Tutorial IV. Vacuum Filtration Demo Video
4	**Distillation**	• Simple Distillation (Informational Video) • Fractional Distillation (Informational Video)
5	**Steam Distillation**	I. How Steam Distillation Works (Informational Video) II. Evacuation Technique (how to dry your oil) Demo Video • Extra! Isolate your own essential oils with Steam Distillation
6	**Thin-Layer Chromatography**	I. TLC Online Tutorial II. TLC Demo Video
7	**Extraction of Caffeine from Cola Syrup** **Sublimation of Caffeine**	I. Extraction of Caffeine Demo Video II. Sublimation of Caffeine Demo Video III. Rewatch Evacuation video • Extra! Extracting Caffeine from Coffee grounds at home
8	**Infrared Spectroscopy**	I. Infrared Spectroscopy (Informational Video) II. IR Spectra (Informational Video) III. Online IR Tutorial
9	**Microscale Bromination of Cholesterol**	
10	**Nucleophilic Substitution**	Nucleophilic Substitution Informational Video
11	**Alkenes from alcohols**	Elimination Rxns (Informational Video)
12	**The Synthesis of an Alkyne from an Alkene**:	
13	**Column Chromatography**:	I. Column Chromatography (Informational Video) II. Column Chromatography Demo Video

Informational Videos: Background information for the experiment
Demo Video: Demonstrations of the techniques
Extra!: Cool videos that you may find interesting. Demonstrating chemistry in the home

Organic Lecture II (CHE 234) Fall 2018

Time: Tu,Th 4:30–5:45 pm **Location**: DA 337
Instructor: Prof. Naphtali O'Connor **Office Hours**: Thursday 10:30-11:30 am (DA 107) and by appointment
Contact Info: naphtali.oconnor@lehman.cuny.edu

Place of Course in Program

Continuation of CHE 232.PREREQ: CHE 232. COREQ: CHE 235. 3 credits

Learning Goals

Students will utilize and learn a variety of skills which include critical thinking, quantitative reasoning and communication skills. Cooperative learning methods are employed to make students feel more comfortable in the learning environment and to develop their collaborative skills. Students also obtain a grasp of the role organic chemistry plays in life and society.

Course Objectives and Description

This continuation organic chemistry course focuses on the methods used to identify the structure of organic molecules, organic reaction mechanisms, and methods used for the synthesis of organic compounds. Topics include aromaticity, chemistry of functional groups, spectroscopy and structure elucidation with an emphasis on the application of infrared and nuclear magnetic resonance spectroscopy.

Academic Policies and Common Misconceptions

School policy towards, grades, withdrawals and incompletes can be found in the undergraduate bulletin. To summarize:

- "The grade of W, withdrawal without penalty, is awarded only when it is clear that a student has a good and sufficient reason for withdrawing from a course and is doing so at a time when he or she is doing passing work in the course."
- "The INC grade covers any failure to complete all requirements for a course, such as submitting a paper or taking a final examination. For an instructor to grant an INC, the student must have met the instructor's attendance requirements in the course and have a passing semester average." If a student receives an INC, they will be asked to complete the missing material (example: Final Exam). They will not be allowed to sit in on the course in a later semester and poor performances erased.
- There is NO additional material or extra credit for failing students to improve their grades.
- The grading system consists of A through F. Grades are determined by your performance on the graded materials and a grade of D cannot be changed into an F.

Class Conduct and Academic Integrity

Disruptive behavior (eg. Mp3 players, use of cell phones, conversing during lecture, eating disruptive food) are not permitted. You will be asked to stop this behavior or to leave the classroom. Place your cellphones in **silent mode** during class. All communication with the instructor must be in a professional manner. Internet equipped devices (cellphones, smart watches etc) must be turned off or on airplane mode and cannot be on your person during exams. If you are caught with an internet equipped device **on your person during the exam,** your exam will immediately be taken from you and reported as cheating.

For the college's policy towards academic integrity see the Lehman Undergraduate Bulletin. Students found cheating will be brought on charges of academic dishonesty which can result in a F in the course and even suspension or expulsion from the college.
http://www.lehman.edu/lehman/about/policies_pdf/CUNYAcademicIntegrityPolicy.pdf

Required Materials and Resources

- Classroom Response and Online Homework System: Tophat.com (Registration instructions on page 3)
- Organic Chemistry a Guided Inquiry; Andrei Straumanis. ISBN-10: 0-618-97412-1

BlackBoard and TopHat Resources:

- Lecture Slides
- Online video links
- Sample exams

Where you can go for help:
TA: Aanchal Tyagi (see TA for office hours, Davis 322)
Science Learning Center (Gillet Hall, 133)

Grading

The total number of points for the class is 500. A breakdown by letter grade is shown but **may be altered as needed**.

	Points	**% Grade**
Midterm Exams (2 exams)	200	40% (20% per exam)
Final Exam	150	30%
Homework	50	10%
Attendance	25	5%
Recitation	75	15%

Point Score	**%Grade**	**Letter Grade**
450-500	90-100	**A**
400-445	80-89	**B**
350-395	70-79	**C**
300-345	60-69	**D**
Below 300	60	**F**

Exams: Each one-hour exam is worth 100 points; for a total of 200.

Final Exam: The cumulative final exam is comprised of 150 points. Unless granted by the professor there are **NO MAKE-UP EXAMS** for missed midterm exams. If an acceptable extenuating circumstance causes you to miss a midterm exam, the final may take the place of the missed exam and be 250 pts (50% of your grade). Students may be given seating assignments or moved during the exam. See above for policy on internet equipped devices during exams.

Homework: Online homework will be assigned using the Tophat.com homework system. This will be worth a total of 50 pts.

Attendance: Attendance will be taken using the Tophat.com class participation system. This will account of 25 pts (5%) of your final grade.

Recitation: 75 pts (15%) of your grade will be determined by your attendance, participation and performance in recitations.

Important Dates

- Last day to withdraw from Fall 2018 classes with a grade of "W" — Tuesday November 6
- Labor Day, college closed — Monday September 3
- No classes scheduled — Mon-Tue September 10-11
- No classes scheduled — Tue-Wed September 18-19
- Columbus day, College closed — Monday October 8

- Thanksgiving Holiday, College closed — Thu-Sun November 22-25
- Last day of classes — Wednesday December 12

Exam

Midterm Exam 1	Thursday, October 11	
Midterm Exam 2	Tuesday, November 20	
Final Exam		

Registering and using Tophat

You will be using your own device to give electronic responses into the classroom response system. These devic es can be cellphones, laptop computers or tablets. You have the option of downloading an app onto your smartphone. You must also register to do this. To register, you need this information:

1. The 6-digit course code: 189560
2. The password: CHE234_Fall18

Create an Account

1. Go to http://app.tophat.com/e/189560 to access the class directly (preferred) or to tophat.com and use 189560 as the course code.
2. Click to create an account (link may be at the bottom).

Enroll in this Class

1. Select this course to enroll. You will also may need to enter the password "CHE234_Fall18".
2. At this point, you will need to register/purchase your registration code.
3. Payment information will be requested at this point. Select your code choice (either 1 semester or 1-year code). The costs are:
1-semester code = $26
4. You will also need to purchase the online textbook ($65) which provides access to the online homework system.
5. There is an addition $10 for Tophat test which we will be using this semester.

Course Schedule and Readings

Chapter	Topics	Sections
Chp 12	Alkenes: Addition Rxns	12.1-12.14
Chp 19	Conjugated systems	19.1-19.7
Chp 20	Aromaticity	20.1-20.4
Chp 21	Reactions of Aromatic Compounds	21.1-21.3
Chp 17	Spectroscopy: NMR	17.1-17.4
Chp 14 & 15	Alcohols and Ethers	14.3-14.6, 15.3-15.4
Chp 22	Aldehydes and Ketones	22.2-22.5
Chp 26	Enols and Enolates	26.1-26.3
Chp 24 & 25	Carboxylic Acids and Derivatives	24.3-24.5, 24.7, 24.10

Organic Laboratory II (CHE 235) Fall 2018

Time:
Location:
Instructor:
Office Hours:
Contact Info:

Required Material:

- "*Macroscale and Microscale Organic Experiments*" Houghton Mifflin Publishing Company, 6th edition, 20011
- Laboratory Notebook
- Safety Goggles (*provided*)
- Padlock for drawer (student provided)
- Paper towels and liquid soap (student provided; often shared by students)

Learning Goals

Students will learn the ability to analyze data and form conclusions. They will utilize critical thinking to solve complex chemical problems, e.g. understanding of structure-reactivity relationships, synthetic logic, spectroscopy, problem solving. They will develop skills in recognizing hazards, minimizing risks, and safe laboratory practices. They will also develop the ability to understand physical properties of chemicals (eg. Molecular weight, acidity, polarity, electronegativity), chemical reactivity, kinetics, thermodynamics and equilibria. They well learn to perform calculations related to chemical reactions (eg. Molecular Weight, molarity, Percent Yield) and to perform various measurements. They will demonstrate the ability to communicate through the writing of lab reports. In lab reports students must exhibit the drawing of chemical structures and the description and analysis of chemical processes.

Course Objectives

The aim of the Organic Chemistry Laboratory Series is to provide you with an opportunity to learn about the synthesis, separation, purification, and identification of organic compounds. This course consists of weekly laboratory sections which involve experiments designed to help students develop the observational and critical thinking skills that are essential prerequisites for a successful career in science (or any professional field). You are expected not only to perform the experiments in the laboratory, but also to think about the principles behind the experiments.

Safety

Safety will be strictly enforced! All students must sign a safety agreement before working in lab. Students are required to follow all safety rules, **wear safety equipment (goggles)** and proper clothing (**NO open-toed shoes, shorts, miniskirts, or sleeveless tops**) at all times. Food, media devices (e.g. mp3 players) and cellphones are not permitted. Failure to follow safety rules will result in loss of points from lab score. In extreme cases expulsion from the lab section and a zero score for the week's experiment may be warranted.

Experiments

A calendar of experiments and detailed instructions on lab reports is provided on Blackboard. This calendar provides the list of experiments, reading and assignments. See the instructions for writing in your lab notebooks. Experiments should be clearly written, important data highlighted and 3-4 pages long.

Absences and Late Lab Reports

Please note the due date given for lab reports by the instructor. They are to be submitted at the start of class. Make-up labs are not allowed. Late lab reports can be penalized by up to 100% depending on how late the assignment is and the instructions you are provided.

Grading

The course grade is comprised of 2 components: Experiments and a Final Quiz.

Experiments

Lab reports are graded out of 10 pts. Grading is based upon:

1) neatness/organization and clarity of writing,
2) lab skills and performance,
3) lab preparation and cleanup,
4) tardiness,
5) analysis.

Pre-labs are checked at the beginning of every lab. The **Post-lab** write-up **must be typed**. **Lab reports** are due at the **beginning of class the next week**. If you miss a lab, it is your responsibility to turn the due lab report within the week it is due **not at the next course meeting**, otherwise points will be deducted.

Grading Rubric

	Pre-lab	*In-lab*	*Post-lab*
Presentation/Organization			
Lab Skills,Tardiness,Clean-up			
Data collection			
Analysis			

Final Quiz

The final covers all of the principles from all the experiments done during the semester.

The table below breaks down the how grades will be assigned:

Assignment Types	**# Assignments**	**Points Each**	**Total Points**	**% of Final Grade**
Lab	**12(1 report is dropped)**	**10**	**110**	**91%**
Final Quiz			**10**	**9%**

Cleanup Points: In the organic chemistry teaching labs you are expected to take care of the equipment and lab space that you use. If you fail to return equipment to their proper place or leave your area untidy, you will be deducted points.

Academic Honesty

Academic dishonesty will not be tolerated. While collaboration in lab is allowed, written lab work is an individual effort. **Copying from any portion of the written work from other students is not allowed and constitutes academic dishonesty**. For the college's policy towards academic integrity see the Lehman Undergraduate Bulletin. http://www.lehman.edu/undergraduate-bulletin/academicintegrity.htm

Lehman College of the City University of New York **Department of Chemistry**
Organic Chemistry Laboratory 1 (CHE 235)

- **Text**: K. L. Williamson and K. M. Masters; **"Macroscale and Microscale Organic Experiments,"** Brooks/Cole, Cengage Learning, **6th** Edition, 2011. ***ISBN13: 978-0-538-73362-5***
- **Chemistry Laboratory Notebook:** Available in the bookstore or outside sources.

List of Experiments and Assignments

Meeting	Reading	Experiment
1		**Check In.** Lab Equipment and Glassware **pp.12-14**, Discussion of writing "**The Laboratory Notebook**." **pp.18-25** Discussion of Laboratory **Safety** and **Waste Disposal**, **pp.26**. Safety Video
2	Chp 55 p 668	**The Borohydride Reduction of a Ketone:** Macroscalescale (p 670) Emphasis on the absolute configuration of stereogenic centers in the product.
3	Chp 41 p 529	**Acetylsalicylic Acid (Aspirn):** Exp Synthesis of aspirin using three different catalysts (macroscale p533). Omit boron trifluoride etherate. Get the MP of your aspirin. Test for aspirin purity: Ferric chloride test for phenols (hand outs)
4	Chap 48 p 617	**Diels Alder Reaction:** Exp 1; Cracking of Dicyclopentadiene (macroscale p 622) will be done by the instructor. Exp 2; Synthesis of *cis*-norbonene-5,6-endo-dicarboxylicanhydride (microscale pp623)
5	Chp 22 p 356	**Oxidation: Cyclohexanol to Cyclohexanone:** Exp 22.3 (p 361). *Continue to completion following* ***'The isolation of Cyclohexanone from the Steam Distilate'*** (p.362)
6	Chp 12 pp 239	**NMR Spectroscopy:** Write only one page introduction in your lab notebook. Instructor discretion for the method of presentation.
7	handouts	**Qualitative Instrumental Organic Analysis.** Special instructions by the instructor. Functional group determination of unknown compounds, wet chemistry.
8	40 and Handouts	**Esterification:** Synthesis of Oil of Wintergreen (methyl salicylate) 12 (p 239) and Use of NMR instrument: Obtaining the spectra of the unknowns.
9	Chp 29 p 406	**Friedel-Crafts Alkylation:** Exp 29.4 1,4-di-*t*-butyl-2,5-dimethoxybenzene (microscale p 413). (Follow procedure only to the end of….. **'wash the crystals thoroughly with water.'**)
10	Chp 25,40	**(1) Catalytic Hydrogenation:** Exp 25.4 (p 385) Transfer hydrogenation of olive oil (microscale p 515 and p 387) and Isolation of Products (p 387); **(2) Esterification and Hydrolysis:** Exp 40.5 Saponification: The preparation of soap (microscale, p 525).
11	Chp 38 p 490	**Grignard Synthesis:** (1) Exp 38.1 Phenylmagnesium bromide (microscale p495); (2) Exp 38.2 Triphenylmethanol (p 497)
12	Chp 63 Pp 719	**Carbohydrates and Sweetners:** (1) Exp 63.1 Molisch test (p 723); (2) Exp 63.2 Red Tetrazolium (RT) test (p 723); (3) Exp 63.4 Bial's test (p724).
13	Chp 37 p 484 Chp 67 p 757	I. **Dibenzalacetone by the Aldol Condensation:** Exp Synthesis of dibenzalacetone (macroscale p 486). II. **Polymers: Synthesis and Recycling:** Experiment 67.1 Nylon by Interfacial Polymerization (p763) Procedure (Macroscale, p 765)
14		**Final Quiz and Check Out**

INTRODUCTION TO BIOCHEMISTRY CHE-244 SYLLABUS
SPRING 2019

I. PRE-REQUISITES:

Successful completion of **CHE 120 -**Essentials of Organic Chemistry Lectures

II. INSTRUCTOR:

Professor Prabodhika Mallikaratchy
Email: Prabodhika.mallikaratchy@lehman.cuny.edu
Office: New Science Hall 4404
Telephone: 3475774082

III. LECTURE SCHEDULE:

Tuesday, Thursday 4.35 -5.50 PM Davis 335 (Lecture)
Office hour: Tuesday 3pm-4pm S-4404 or by appointment

IV. TEXT AND TECHNICAL ISSUES

Recommended textbook: Lippincott's Illustrated Reviews: Biochemistry Sixth edition

Or any other standard introductory Biochemistry text book including:

- *General, Organic and Biological Chemistry Karen Timberlake, Fifth Edition.*
- *Biochemistry a Short Course, Second Edition, John L. Tymoczko, Jeremy M. Berg and Lubert Stryer*
- *Biochemistry – The molecular basis of life McKee and McKee 6th Edition (you can purchase this book with homework)*
- *Biochemistry free and eazy* ***http://biochem.science.oregonstate.edu/content/biochemistry-free-and-easy***

This course will require an iclicker. Please purchase an iClicker from the bookstore.

V. COURSE OBJECTIVES:

After completing this course students should be able to:

- Describe the structure(s) of a typical, amino-acid, lipid, nucleotide and sugar
- Understand the factors that influence the activity of proteins
- Understand the kinetics of enzyme activity and how this can be modified
- Describe typical catabolic pathways in eukaryotic cells
- Understand how ATP is produced in the cell and how redox and energy levels in the cell are regulated

VI. COURSE REQUIREMENTS AND GRADING

REQUIRED HOME WORK:
Sapling homework assessment for each work will be based on the material covered in-class. Please register at Sapling homework CHE 244.

How to set-up your Sapling account:

Students:

1. Go to http://saplinglearning.com and click on your country ("US Higher Ed" or "Canada") at the top right.

2a. If you already have a Sapling Learning account, log in and skip to step 3.

2b. If you have Facebook account, you can use it to quickly create a Sapling Learning account. Click the blue button with the Facebook symbol on it (just to the left of the username field). The form will auto-fill with information from your Facebook account (you may need to log into Facebook in the popup window first). Choose a password and timezone, accept the site policy agreement, and click "Create my new account". You can then skip to step 3.

2c. Otherwise, click the "Create an Account" link. Supply the requested information and click "Create My Account". Check your email (and spam filter) for a message from Sapling Learning and click on the link provided in that email.

3. Find your course in the list (you may need to expand the subject and term categories) and click the link.

4. If your course requires a key code, you will be prompted to enter it.

5. If your course requires payment, select a payment option and following the remaining instructions.

Once you have registered and enrolled, you can log in at any time to complete or review your homework assignments. During sign up or throughout the term, if you have any technical problems or grading issues, send an email to support@saplinglearning.com explaining the issue. The Sapling Learning support team is almost always faster and better able to resolve issues than your instructor.

EXAMS:

For this class there will be 3 mid-session exams and a final exam that will contain multiple-choice questions.

Class assignments and exams	Points
Completion of weekly Sapling Home Work Assignments	150
IClicker sessions	150
Mid Term Exam 1	300
Mid Term Exam 2	300
Mid Term Exam 3	300
Final exam	300
Total points	**1500**

Homework and Exam policy

- **All home work assigned must be completed by the deadline indicated in the HW assignment. Students who fail to complete these assignments will be given 0 for their homework assignments.**

- **Mid Term exams are available to review only within two weeks following the exams. After two-week period, no mid-term exams will be available review.**

- **No make-up exams will be given.**

VII. ATTENDANCE POLICY

Students should be present at every class. Iclicker points are given for students who respond to iclicker questions presented in class and for attendance.

A student cannot miss mid-term assessments. For the final grade the presence at the final exam is compulsory.

VIII. TENTATIVE COURSE OUTLINE

Topic	Home work Assignment
Lecture 00_introduction to the class	
Introduction to enzymes-1	01
Introduction to enzymes-2	01
Structure of Carbohydrates-1	02
Structure of Carbohydrates-2	02
Reactions of carbohydrates	03
Review session	
Mid Term-1	
Glycolysis	04
Gluconeogenesis	05
Pentose Phosphate Pathway	06
The Citric Acid Cycle	07
Review session	
Mid Term- 2	
Structure of Amino-acids	08
Ionization Properties of Amino Acids	09
Amino Acid Metabolism and regulation of Amino acid metabolism, relevance to diseases	10
Review session	
Mid Term- 3	
Introduction to Lipids	11
Lipid metabolism and regulation of lipid metabolism, relevance to diseases	12
Oxidative Phosphorylation and Proton motive force Regulation of oxidative phosphorylation	13
Review session	
Final Exam	

IX. CLASSROOM POLICY

Lecture notes availability: Lecture notes are available only after the lecture and will not be available prior to lectures.

Food policy: Food and drinks are not allowed in the classroom.

Cell Phone Policy. Cell phones are disruptive, even in vibrate mode. Make sure your cell phone is switched off before class starts. Text messaging during class is also highly disruptive

and not allowed. If a cell phone rings during class, lecture will be stopped, until the student will shut down the device and the following penalties are applicable
5 pts penalty if your cell phone rings while in class;
10 pts penalty if you continue the disturbance (e.g., by letting it ring again)
15 pts penalty for 1st ring on 2nd occasion
Other electronic devices Policy No electronic devices can be used or kept accessible during examinations; this includes, but is not limited to i-Phones, cell-phones, beepers, iPods, MP3 players, tape-recorders, PDAs, **Bluetooth** and other computing or music devices.

Only **basic** calculators will be allowed.

X. ACADEMIC INTEGRITY

While honest scholarship is time-consuming and often requires hard work, it is also the primary process by which students learn to think for themselves. Faculty members must teach respect for methods of inquiry within the various disciplines and make assignments that will encourage honest scholarship; students in turn must uphold a standard of honesty within the College, thereby affirming the value and integrity of their Lehman degree. The following definitions and procedures govern cases involving undergraduate student work.

The most common forms of academic dishonesty are cheating and plagiarism. Cheating is the use or attempt to use unauthorized material, information, notes, study aids, devices, or communication during an academic exercise (for example, using unauthorized books, papers, or notes during an examination; or procuring, distributing, or using unauthorized copies of examinations). Plagiarism means the failure to give credit for the source of another's words or ideas, including but not limited to books, articles, interviews, and multimedia and electronic sites, or—as in the use of borrowed or purchased papers—passing off another person's work as one's own. (Section 213-b of the New York State Education Law prohibits the sale of term papers, essays, and research reports to students enrolled in a college.) Common forms of cheating and plagiarism are highlighted in this Bulletin.

Academic dishonesty is a serious violation of the accepted values of the College. When questions of a breach of academic integrity arise, instructors will inform the students of their suspicions and provide the student with a Faculty Report Form for Incidents of Suspected Academic Dishonesty. The instructor must remember that a student's failure to respond to charges of academic dishonesty is not in and of itself an indication of guilt. The report will include an explanation of the incident, the instructor's intended academic sanction, and an indication whether or not the instructor is recommending that the College undertake disciplinary proceedings pursuant to Article 15 of the Board of Trustees Bylaws.

Academic sanctions may include but are not limited to the following:

1. a grade of F for the course.

Disciplinary procedures are governed by Article 15 of the Board of Trustees Bylaws. In the event the student is found guilty of academic dishonesty by a Faculty-Student Disciplinary Committee, penalties that may be imposed include but are not limited to: 1) suspension from the College or 2) expulsion from the College. Although the Office of the Vice President for Student Affairs will be guided by the recommendation of the instructor, it reserves the right to seek disciplinary sanctions under the disciplinary procedures.Should the instructor become convinced that the suspicions are unfounded, no further action will be taken and the Faculty Report Form will be destroyed. If the suspicions are founded and if both the student and the instructor are willing, they may agree upon a resolution. Subsequently the instructor will present the completed Faculty Report Form, including the charges and resolution, to the department chair who must forward the appropriate copies of the form to the Office of Academic Standards and Evaluation, and the Office of the Vice President for Student Affairs. If no agreement is reached, the instructor must allow a student to complete all coursework until the following appeal process has been completed.

- The first step in the appeals process is for the instructor to file the Faculty Report Form with the chair. If the term is completed, the instructor may assign a grade that reflects the intended sanction but must also provide a final grade that does not include the intended sanction if the charges are not upheld.
- If the charges are for cheating, then the chair will submit the charges to the Office of the Vice President for Student Affairs. If the charges are for plagiarism, the chair will appoint a committee of three Lehman College faculty members, which will adjudicate the matter within three weeks by majority vote. If the chair is the instructor in question, the senior member of the department Personnel and Budget Committee will act for the chair. The committee will provide written notification of its decision to the chair, who will forward this recommendation and the Faculty Report Form to the Office of the Vice President for Student Affairs.
- The Office of the Vice President for Student Affairs will review the recommendations of the instructor and the committee for possible disciplinary sanctions and provide a written notification of its decision to the department chair, the student, the instructor, and the Office of Academic Standards and Evaluation. Either the instructor or the student has the right, within three weeks of receipt of notification, to appeal the department decision in writing to the Committee on Admissions, Evaluation, and Academic Standards, which will act as adjudicator of last resort. Should any part of the three-week period fall outside the regular semester, the first three weeks of the next regular semester shall apply.

The Office of Academic Standards and Evaluation will keep all records of such proceedings on file until the student's graduation, at which time they will be destroyed.

As a result of a second upheld charge of academic dishonesty, disciplinary procedures will be pursued by the Office of the Vice President for Student Affairs as governed by the procedures under Article 15 of the Board of Trustees' Bylaws.

The following definitions and examples are adapted from the CUNY Policy on Academic Integrity.

Cheating is the unauthorized use or attempted use of material, information, notes, study aids, devices, or communication during an academic exercise. Examples of cheating include, but are not limited to the following:

- Copying from another student during an examination or allowing another student to copy your work.
- Unauthorized collaboration on a take-home assignment or examination.
- Using illegal notes during a closed-book examination.
- Taking an examination for another student, or asking or allowing another student to take an examination for you.
- Changing a graded exam and returning it for more credit.
- Submitting substantial portions of the same paper for more than one course without informing each instructor.
- Preparing answers or writing notes in a blue book (exam booklet) before an examination.
- Allowing others to research and write assigned papers or do assigned projects, including the use of commercial term paper services.
- Giving assistance to acts of academic misconduct or dishonesty.
- Fabricating data (all or in part).
- Submitting someone else's work as your own.
- Unauthorized use during an examination of any electronic devices, such as cell phones, palm pilots, computers, or other technologies to send or retrieve information.

Plagiarism is the act of presenting another person's ideas, research, or writings as your own. Examples of plagiarism include, but are not limited to the following:

- Copying another person's actual words without the use of quotation marks *and* citations.
- Presenting another person's ideas or theories in your own words without acknowledging the source.
- Using information that is not common knowledge without acknowledging the source.
- Failing to acknowledge collaborators on assignments.
- Purchasing or downloading term papers online.
- Paraphrasing or copying information from the Internet without citing the source.
- "Cutting and pasting" from various sources without proper attribution.

Lehman College
City University of New York
Department of Chemistry

Quantitative Analysis CHE-249
Fall - 2018

Instructors: Marc S. Lazarus,
Office Hours:
Office: Davis Hall 336
Telephone: (718)960-8843
e-mail: marc.lazarus@lehman.cuny.edu

Course Description

8 hours (2, lecture; 6, lab), 5 credits. Fall term only. Principles of gravimetric, volumetric, and spectrophotometric analysis. Methods involving acidimetry, precipitation, chelation, oxidation, and iodometry. Analytical separations. PREREQ: CHE 168-169.

Place of course in degree program

This laboratory is a degree program requirement for the Chemistry, and Biochemistry majors. This is also the elective course recommended for Chemistry minors.

Academic or Learning Objectives

Student Learning Outcomes: After completing this course students should be able:

a. to make precise and accurate measurements using physical and chemical equipment and instruments.

b. to understand the fundamental concepts of analytical chemistry.

c. to use the mathematical and statistical analysis to assess the precision of the measurement.

d. to apply appropriate analytical techniques to obtain quantitative chemical in formation from unknown samples.

Required Readings

Fundamentals of Analytical Chemistry, Ninth Edition, by Douglas A. Skoog, Donald M. West, F. James Holler and Stanley R. Crouch, Brooks/Cole, Cengage Learning, Belmont, CA, 2014.

Course Requirements and Grading

A student's grade in the CHE 249 class will be determined from a combination of grades given for laboratory reports with grades obtained from three lecture exams. The student's laboratory report grade will be determined by averaging the grades obtained by the student on the eight laboratory reports. The student's lecture average will be determined by averaging the grades from three lecture exams. A regular two hour final exam will be given in the course. The student's final grade will be calculated by summing 50% of the laboratory report average with 20% of the exam average and 30% of the final exam grade.

Attendance Policy

The attendance to the laboratory is compulsory. A student cannot miss more than TWO laboratories. For the case of missing more than two laboratories the student will not receive a passing laboratory grade. **No make-up laboratories will be given. This is in accordance with the chemistry department's policy.**

Accommodating Disabilities

Lehman College is committed to providing access to all programs and curricula to all students. Students with disabilities who may need classroom accommodations are encouraged to register with the Office of Student Disability Services. For more information, please contact the Office of Student Disability Services, Shuster Hall, Room 238, phone number, 718-960-8441.

The Science Learning Center (SLC)

The Science Learning Center (SLC) is the tutoring center on campus. The SLC provides drop-in tutoring for natural and computer science courses. To obtain more information about the SLC, please visit their website at http://www.lehman.edu/issp, or please call the ACE at 718-960-8175,

Classroom Policy:

Food policy: FOOD and **DRINKS** are **STRICTLY PROHIBITED** in the chemistry laboratory.

Electronic devices Policy: No electronic devices can be used or kept accessible during exams or quizzes; this includes, but is not limited to i-Phones, smart watches, google glasses, cell-phones (any type), beepers, iPods, MP3 players, tape-recorders, PDAs, **bluetooth** and other computing or music devices. Only **basic scientific** calculators will be allowed. **Graphing Calculators are not acceptable**.

Required Equipment (to be provided by the student)**:** padlock; detergent; paper towels; matches

SAFETY GLASSES MUST BE WORN AT ALL TIMES IN LABORATORY! The students without **SAFETY GLASSES will be not allowed to work in the laboratory**

Academic Integrity

See the Lehman Undergraduate Bulletin.

Course topics

The following topics will be covered:
Measurements and Statistics, Calibration, Chemical Equilibria, Titrations, Electrochemistry, Spectrometry, Analytical Separations.

COURSE LECTURE OUTLINE

No.	Subject
1.	Chapter 4 Calculations Used in Analytical Chemistry - Units of measurement - Solutions and their concentrations - Chemical Stoichiometry
2.	Chapter 5 Errors in Chemical Analysis - Precision and accuracy - Systematic errors Chapter 6 Random Errors in Chemical Analysis - The nature of random errors
3.	- The population standard deviation - The sample standard deviation - Variance and other measures of precision - Propagation of random errors - Reporting computed data
4.	Chapter 7 Statistical Data Treatment and Evaluation - Confidence intervals, z test, t test - Analysis of variances - Detection of gross errors, Q test
5.	Chapter 8 Sampling, Standardization and Calibration - Analytical samples and methods - Sampling - Standardization and calibration
6.	- Sensitivity and detection limit - Linear dynamic range
7.	Chapter 9 Aqueous Solution and Chemical Equilibria - Chemical composition of aqueous solutions - Chemical Equilibrium
8.	- Buffer solutions Chapter 10 Effect of Electrolytes on Chemical Equilibria - Effect of electrolytes on chemical equilibria
9.	- Activity coefficients Chapter 14 Principles of Neutralization Titrations - Solutions and indicators for acid base titrations - Titrations of strong acids and bases
10.	- Titration curves for weak acids - Titration curves for weak bases - Composition of solutions during acid/base titrations
11.	Exam 1
12.	Chapter 15 Complex Acid- Base Systems - Mixtures of strong and weak acids or strong and weak bases - Polyfunctional acids and bases - Buffer solutions involving polyprotic acids
13.	- Calculations of the pH for solution of NaHA - Titration curves for Polyfunctional acids and bases

14.	Chapter 17 Complexation and Precipitation Reactions and Titrations - The formation of complexes - Complexation titrations - Complexes of EDTA and metal ions
15.	Chapter 18 Introduction to Electrochemistry - Characterizing Oxidation/reduction reactions - Electrochemical cells
16.	- Electrode potentials
17.	Chapter 19 Applications of Standard Hydrogen Electrodes - Constructing redox titration curves - Oxidation/Reduction indicators
18.	Chapter 20 Application of Oxidation/Reduction Titrations - Applying standard reducing agents - Applying standard oxidizing agents
19.	Chapter 21 Potentiometry - General Principles - Reference electrodes
20.	- Liquid-junction potentials - Indicator electrodes
21.	Exam 2
22.	Chapter 24 Introduction to Spectrochemical Methods - Properties of electromagnetic radiation - Interaction of radiation
23.	- Absorption of radiation - Emission of electromagnetic radiation
24.	Chapter 26 Molecular Absorption Spectrometry - Ultraviolet and visible absorption spectroscopy - Infrared absorption spectroscopy
25.	Chapter 31 Introduction to Analytical Separations - Separation by precipitation - Separation by distillation - Separation by Extraction
26.	- Separation by ion exchange - Chromatographic separation
27.	Chapter 32 Gas Chromatography - Instruments for gas –liquid chromatography - Gas chromatographic columns and stationary phases
28.	Chapter 33 High Performance Liquid Chromatography - Instrumentation - Partition Chromatography - Ion Chromatography - Affinity Chromatography - Chiral Chromatography
Final Exam	

COURSE LABORATORY OUTLINE

1. Check in, Weighing Technique and Proper Use of Buret and Pipet. Begin the Preparation of Solutions for Iodometric Analysis of Vitamin C for the Next Experiment.
2. Iodometric Analysis of Vitamin C (Chap. 13, Skoog et al.) and Calibration of a Pipet
3. EDTA Titration of Ca^{2+} and Mg^{2+} in Limestone (Chap. 17D-7, -9, Skoog et al.)
4. Determination of F^- Using an Ion Selective Electrode (Chap. 21D-5, Skoog et. Al.)
5. Potentiometric Titration of Fe^{2+} in Unknowns (Chap. 21, Skoog et al.)
6. Spectrophotometric Analysis of a Mixture: Caffeine and Benzoic Acid in an Unknown (Chap. 25, 26 Skoog et al.)
7. Microscale Spectrophotometric Measurement of Iron in Limestone by Standard Addition
8. Separation of Ni^{2+} from Co^{2+} using an Anion Exchange Column (Chap.31D, Skoog et al.)
9. Determination of the Composition of a Mixture of Organic Compounds using Gas Chromatography (Chap. 32, Skoog et al.)
10. Check Out

CHE-249 Quantitative Analysis 2018 Fall Semester Revised
Please Note: This schedule is subject to minor change so that course material can be best presented.

M	Exp.	Tu	Exp.	W	Exp.	Th	Exp.
28-Aug	1	29-Aug	1	30-Aug	1	31-Aug	1
4-Sep	No Class	5-Sep	2	6-Sep	2	7-Sep	2
11-Sep	2	12-Sep	2	13-Sep	2	14-Sep	3
18-Sep	3	19-Sep	*3	20-Sep	No Class	21-Sep	No Class
25-Sep	3	26-Sep	3	27-Sep	3	28-Sep	3
2-Oct	3	3-Oct	4	4-Oct	4	5-Oct	4
9-Oct	No Class	10-Oct	4	11-Oct	4	12-Oct	5
16-Oct	4	17-Oct	5	18-Oct	5	19-Oct	5
23-Oct	5	24-Oct	6	25-Oct	5	26-Oct	6
30-Oct	6	31-Oct	6	1-Nov	6	2-Nov	6
6-Nov	6	7-Nov	7	8-Nov	6	9-Nov	7
13-Nov	7	14-Nov	7	15-Nov	7	16-Nov	8
20-Nov	7	21-Nov	**	22-Nov	8	23-Nov	No Class
27-Nov	8	28-Nov	8	29-Nov	8	30-Nov	8
4-Dec	9	5-Dec	9	6-Dec	9	7-Dec	9
11-Dec	10	12-Dec	10				

CHE 345 **Physical Chemistry Laboratory** Fall 2018
Gabriel I. López-Morales **SYLLABUS** Tuesdays 9:00 – 12:50

Text: Garland, C. W., Nibler, J. W., Shoemaker, D. P., Experiments in Physical Chemistry, 8th edition, McGraw-Hill, New York, 2004. (GNS)
Handouts: When provided, handout information and directions take precedence over those given in the textbook or references.
References: Literature references (in some cases, online copies are provided)
Office Hours: By appointment
Email: gabriel.lopezmorales@lehman.cuny.edu

Experiments

1. **Heat Capacity Ratio for Gases (GNS, pp 106 – 118)**
2. **Equilibrium of a Solute Between Two Immiscible Solvents (K_d) (Handout)**
3. **Constructing a two component Solid-Liquid phase diagram (Handout)**
4. **Adsorption from Solution (Handout)**
5. **Partial Molar Volume (GNS, pp 172 – 178)**
6. **TBA**

Course Schedule[1]

Week:	Description (Date):
1	General instructions, Syllabus (08/28)
2	Statistical analysis (09/04)
3, 4	No class (09/11, 09/18)
5 – 10	Experiments 1 – 3 (09/25 – 10/30)
11 – 16	Experiments 4 – 6 (11/06 – 12/11)
17	Due date: Final Report (12/18)

General Instructions

1. **Preparation for Laboratory.** This is a "problem type" laboratory, and the student is expected to do a considerable amount of preparation before starting an experiment. This should include:
   a) Studying the handout, references and text material relevant to the experiment
   b) Preparing a written outline of the experiment (handout found on blackboard):
      i) A brief statement of the general purpose of the experiment
      ii) A protocol (list or outline) of the steps you will follow to execute the experiment – the protocol should include the amounts (weights, volumes, concentrations) of the materials you will use; a notation of the glassware and instruments you will use to handle them and the desired precision for each measurement (e. g. mass ± 1 g); the instrument(s) you will use to make the physical measurements of the experiment and the precision

[1]The semester will comprise of two six-week periods, and groups will rotate experiments within those periods.

expected in these measurements

iii) Calculations you need to make for above amounts

iv) What kind of results you hope to achieve according to your understanding of the experiment

2. **Written outline.** Must be presented to the instructor for checking at the beginning of the laboratory period in which the experiment is to begin. The student will not begin experimental work until the outline has been submitted.
3. **Participation.** ALL group members are expected to participate during each experiment. It is recommended that before starting the experiment, group members split up the work to be done so that experiments run efficiently. Participation will be considered as part of the overall final grade (see **Grading**).
4. **Number of Experiments.** For the Fall 2018 semester, students must complete multiple experiments in each six-week period (at least 3; number according to class size).
5. **Experiment Worksheets.** At the end of each experiment, each student must hand in a filled in question sheet provided for that experiment. In a group, you may work together to solve the problems on the sheet, but each student MUST hand in an individual worksheet. The worksheets are due, hand written, at 12:50 PM on the day of class the week after the experiment has finished. **Late worksheets will not be accepted**.
6. **Laboratory Report.** At the end of the semester, each student must hand in ONE fully written out laboratory report based on an experiment done in the second 3-weeks period. The expectations of this laboratory report will be discussed in class, as well as an outline provided to you on blackboard. Both a hardcopy and an electronic copy must be submitted by 23:59 on the due date. Electronic copies must be submitted via SafeAssign on Blackboard. **Laboratory reports will not be accepted late** and failure to turn in both the hardcopy and electronic copy on or before its due date will result in a zero for that laboratory report. The handout titled "Recording Experimental Data and Laboratory Report Writing Guidelines" has extensive information on what should be in a laboratory report. Help and advice is available from the instructor on writing the report and it is recommended that the student take advantage of it.

Grading

Grading for this laboratory course will follow the outlined rubric:

a) Completed "Pre-Labs": 10%
b) Laboratory Worksheets: 10% each (50% total)
c) Final Laboratory Report: 25%
d) Laboratory Techniques and Participation: 15%

To ever receive a grade in this course, you must turn in **all** your laboratory question sheets and laboratory reports to the instructor on the day they are due. **NO late assignments will be accepted**.

NOTE: Plagiarism will **NOT** be tolerated in this class. You must give the exact source and page of all references and quoted material. All laboratory reports must be accompanied with an electronic submission that will be scanned for plagiarism. Examples of plagiarism include:

- Buying a term paper or downloading one from online
- Copying from a book without acknowledgement

- Copying a friend's work
- Cutting and pasting from a website
- Failing to give credit for someone else's words or ideas
- Quoting a teacher's lecture without acknowledgement
- Paraphrasing without citation
- Quoting words or phrases without credit
- Copying a paragraph and rewriting each sentence so that each one conveys the same meaning
- Wikipedia is not a source to be cited

The sanction for the first instance of plagiarism is failure for that laboratory. The sanction for a second instance of plagiarism is failure for the course. Disputes will be mediated via Lehman College's policies regarding plagiarism.

Informative Reading

- Page assignments are from GNS; Brackets [ ] denote optional reading. Other references are to the handouts "Uncertainty in Measurement" and "Recording of Experimental Data and Laboratory Report Writing Guidelines."
- Introduction, Safety, Data Recording, pp 1-10
- Laboratory Report Writing, pp 10-27 and "Guidelines" handout (where the two differ, follow the handout) Calculations and Presentation of Data, pp 29-38 and "Guidelines" handout
- Uncertainty and Error - Graphical and Numerical methods, pp 37; 38-43 and "Uncertainty" handout
- Rejection of Discordant Data, pp 42-43
- Statistical Treatment of Random Error, [pp 43-52]; "Uncertainty" handout
- Error Propagation, [pp 52-59]; Uncertainty handout, Propagation of Uncertainty handout
- A Case History of Error Evaluation, pp 60-62
- Fundamental Limitations on Instrumental Precision, pp 62-64
- Summary, pp 64-67
- Least Squares Fitting Procedures, pp 724-725; [pp 725-747]; "Uncertainty" handout
- Rejection of Discordant Data in Linearly Dependent Data, pp 732-733.

CHE 347 **Physical Chemistry Laboratory** Spring 2019
Gabriel I. López-Morales **SYLLABUS** Tuesdays 9:00 – 12:50

Text: Garland, C. W., Nibler, J. W., Shoemaker, D. P., Experiments in Physical Chemistry, 8th edition, McGraw-Hill, New York, 2004. (GNS)
Handouts: Handout information and directions (when provided) take precedence over those given in the textbook or references.
References: Literature references (in some cases, online copies may be provided)
Office Hours: By appointment (Davis 302)
Email: gabriel.lopezmorales@lehman.cuny.edu

Experiments

- **Absorption spectrum of a conjugated dye**
- **Freezing-point depression of strong and weak electrolytes**
- **Heats of combustion**
- **Intrinsic viscosity**
- **Partial molar volume**
- **Chemical equilibrium in solution**

Course Schedule

Week:	**Description (Date):**
1	Instructions, syllabus, statistics (01/29)
2	Experiment 1 (02/05)
3	No class (02/12)
4	Experiment 1 (02/19)
5 – 12	Experiments 2 – 5 (02/26 – 04/16)
13	Spring recess (04/19 – 04/28)
14 – 15	Experiment 6 (04/30 – 05/07)
16	Final brief report due (05/14)
17	Final report due (05/21)

General Instructions

1. **Preparation for Laboratory.** This is a "problem-type" laboratory, and the student is expected to do a considerable amount of preparation before starting an experiment. This should include:
    a) Studying the handout, references and text material relevant to the experiment
    b) **Preparing a written outline of the experiment**, this will be extremely important in this course:
        I. A brief statement of the general purpose of the experiment
        II. A protocol (list or outline) of the steps you will follow to execute the experiment – the protocol should include the amounts (weights, volumes, concentrations) of the materials you will use; a notation of the glassware and instruments you will use to handle them and the desired precision for each measurement (e. g. mass ± 1 g); the instrument(s) you will use to

make the physical measurements of the experiment and the precision expected in these measurements

III. Calculations you need to make for above amounts

IV. What kind of results you hope to achieve according to your understanding of the experiment?

2. **Written outline.** Must be presented to the instructor for checking at the beginning of the laboratory period in which the experiment is to begin. The student will not begin experimental work until the outline has been submitted.
3. **Participation.** ALL group members are expected to participate during each experiment. It is recommended that before starting the experiment, group members split up the work to be done so that experiments run efficiently, while **avoiding individual-type work arrangements**. Participation will be considered as part of the overall final grade (see **Grading**). Be aware that overall attitude, common mistakes during procedures (along with the expertise or knowledge on how to correct or overcome these), abilities, and other concurrent elements will be considered inside this part of the final grade.
4. **Number of Experiments.** For the Spring 2019 semester, students must complete multiple experiments (at least 3; the final number will be according to class size and student performance). For this reason, as mentioned previously, all students are required to be fully-prepared for each experiment before starting. Each student group will choose an experiment to start from the list. Ideally, no two groups will be doing the same experiment at the same time. The order in which the groups will rotate between experiments will be assigned by the Instructor.
5. **Brief Reports.** At the end of each experiment, each student will have one week (until the week of the beginning of the next experiment) to hand in a brief, worksheet-type, laboratory report. The guidelines for writing this document, what to include and how to write it, will be provided (on Blackboard (BB)). Students will not start the next assigned experiment if this document is not turned in by the due date.
6. **Laboratory Report.** At the end of the final experiment, each student must hand in **one** official final laboratory report based on any of the experiments done. The expectations of this laboratory report will be discussed in class. There will also be an outline provided to you through BB. Both a hardcopy and an electronic copy must be submitted by 23:59 on the due date. Electronic copies must be submitted via SafeAssign on BB. **Laboratory reports will not be accepted late** and failure to turn in both the hardcopy and electronic copy, on or before its due date, will result in a zero for that laboratory report. Help/advice is available from the instructor on writing the report and it is recommended that the student take advantage of it.

Grading

To ever receive a grade in this course, you must participate in all laboratory experiments, and turn in all your laboratory question sheets and laboratory reports to the instructor on the day they are due. NO late assignments will be accepted.

Grading for this laboratory course will follow the outlined rubric:

a) Completed "Pre-Labs": 3% each (18% total)
b) Brief Laboratory Reports: 7% each (42% total)
c) Final Laboratory Report: 20%
d) Laboratory Techniques, Participation: 15%
e) Attendance: 5%

Note: Plagiarism will **NOT** be tolerated in this class. You must give the exact source and page of all references and quoted material. All laboratory reports must be accompanied with an electronic submission that will be scanned for plagiarism. Examples of plagiarism include:

- Buying a term paper or downloading one from online
- Copying from a book without acknowledgement
- Copying a friend's work
- Cutting and pasting from a website
- Failing to give credit for someone else's words or ideas
- Quoting a teacher's lecture without acknowledgement
- Paraphrasing without citation
- Quoting words or phrases without credit
- Copying a paragraph and rewriting each sentence so that each one conveys the same meaning
- Wikipedia is not a source to be cited, **but can be useful for finding good sources for citation**

The sanction for the first instance of plagiarism is failure for that laboratory. The sanction for a second instance of plagiarism is failure for the course. Disputes will be mediated via Lehman College's policies regarding plagiarism.

Informative Reading

Page assignments are from GNS; brackets [] denote optional reading. Other included references may be provided (if so, they will all be posted on BB).

- Introduction, Safety, Data Recording, pp 1-10
- Laboratory Report Writing, pp 10-27; Calculations and Presentation of Data, pp 29-38
- Uncertainty and Error - Graphical and Numerical methods, pp 37; 38-43
- Rejection of Discordant Data, pp 42-43
- Statistical Treatment of Random Error, [pp 43-52]
- Error Propagation, [pp 52-59]
- A Case History of Error Evaluation, pp 60-62
- Fundamental Limitations on Instrumental Precision, pp 62-64
- Summary, pp 64-67
- Least Squares Fitting Procedures, pp 724-725; [pp 725-747]
- Rejection of Discordant Data in Linearly Dependent Data, pp 732-733

Lehman College
City University of New York
Department of Chemistry

Inorganic Chemistry CHE 442
Fall 2018

Instructor:
Professor: Andrei Jitianu-PhD

Office Hours: Wednesday 1:30 -2:30 PM
Office: Davis Hal 103
e-mail: andrei.jitianu@lehman.cuny.edu

Course Description

CHE 442: **Introduction to Inorganic Chemistry.**
Two lectures are offered twice per week – Monday and Wednesday 4:30-5:45 pm (6:00pm)
3 hours / 3 credits
Inorganic chemical principles including concepts of bonding, intermolecular forces, acid-base behavior, and reduction-oxidation properties. PREREQ: CHE 234 and 249.

Place of course in degree program
This course is a degree program requirement for Chemistry.

Academic or Learning Objectives
- After completing this course students should be able to:
- Carefully state and apply the major basic concepts of inorganic chemistry.
- Understand the periodicity of chemical and physical properties.
- Understand how the nature of chemical bonding influences the molecular structure.
- Recognize the principles of the reduction-oxidation processes and differentiate these from other chemical processes.
- Differentiate between the main types of chemical reactions.
- Describe the Main Group Elements. Synthesis, structure, physical properties, variations in bonding motifs, acid - base character, and reactivity of the elements and their compound
- Differentiate between normal inorganic compounds and coordinative complexes

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Required Readings
Descriptive Inorganic Chemistry Six Edition by Geoff Rayner-Canham and Tina Overton et al, at W.H. Freeman and Company, New York, 2014, ISBN-10 1-4641-2557-0 or ISBN-13: 978-1-4641-2557-7

Course Requirements and Grading
For this class there will be 2 regular exams and a Final exam.
The final grade will be established as follows:

Electronic Homework	- 10%
Exams 1 and 2	- 25% each
Final exam	- 40%

Each student's grade will be determined by counting each regular exam as 25% of the final grade and the final exam as 50% of the final grade. In the event a student misses a regular exam, the 25% for that exam will be included in the final exam. In other words, if a student were to miss **Exam 2**, that student's final exam would count 65%. A student cannot miss more than one exam (Exams 1 or 2). **No make-up exams will be given.** Additional information about the Homework grading and deadlines will be distributed.

Attendance Policy

Students **MUST** be present at every class.

A student cannot miss more than one regular exam. For students to pass the course they must be present at the Final Exam.

Accommodating Disabilities

Lehman College is committed to providing access to all programs and curricula to all students. Students with disabilities who may need classroom accommodations are encouraged to register with the Office of Student Disability Services. For more information, please contact the Office of Student Disability Services, Shuster Hall, Room 238, phone number, 718-960-8441.

Classroom Policy:

Food policy: Food and drink are not allowed in the classroom.

Cell Phone Policy. Cell phones are disruptive, even in vibrate mode. Make sure your cell phones are in silent mode before class starts. Text-messaging during class is also highly disruptive (besides absolutely rude) and is forbidden. If a cell phone rings during class, lecture will be stopped, until the student turns the device off. The following penalties are applicable:

> **5 pt penalty** if your cell phone rings while the instructor is in class; **10 pt penalty** if you continue the disturbance (e.g., by letting it ring again); **15 pt penalty** for the 1st ring that occurs at any future class session.

Electronic devices Policy No electronic devices can be used or kept accessible during examinations; this includes, but is not limited to graphing calculators, smart watches, any SMART Devices, i-Phones, cell-phones, beepers, iPods, MP3 players, recorders, PDAs, **Bluetooth** and other computing or music devices. Only **basic scientific** calculators will be allowed

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Academic Integrity

While honest scholarship is time-consuming and often requires hard work, it is also the primary process by which students learn to think for themselves. Faculty members must teach respect for methods of inquiry within the various disciplines and make assignments that will encourage honest scholarship; students in turn must uphold a standard of honesty within the College, thereby affirming the value and integrity of their Lehman degree. The following definitions and procedures govern cases involving undergraduate student work.

The most common forms of academic dishonesty are cheating and plagiarism. Cheating is the use or attempt to use unauthorized material, information, notes, study aids, devices, or communication during an academic exercise (for example, using unauthorized books, papers, or notes during an examination; or procuring, distributing, or using unauthorized copies of examinations). Plagiarism means the failure to give credit for the source of another's words or ideas, including but not limited to books, articles, interviews, and multimedia and electronic sites, or—as in the use of borrowed or purchased papers—passing off another person's work as one's own. (Section 213-b of the New York State Education Law prohibits the sale of term papers, essays, and research reports to students enrolled in a college.) Common forms of cheating and plagiarism are highlighted in this Bulletin.

Academic dishonesty is a serious violation of the accepted values of the College. When questions of a breach of academic integrity arise, instructors will inform the students of their suspicions and provide the student with a Faculty Report Form for Incidents of Suspected Academic Dishonesty. The instructor must remember that a student's failure to respond to charges of academic dishonesty is not in and of itself an indication of guilt. The report will include an explanation of the incident, the instructor's intended academic sanction, and an indication whether or not the instructor is recommending that the College undertake disciplinary proceedings pursuant to Article 15 of the Board of Trustees Bylaws.

Academic sanctions may include but are not limited to the following:

1. **a grade of F for the course**.

Disciplinary procedures are governed by Article 15 of the Board of Trustees Bylaws. In the event the student is found guilty of academic dishonesty by a Faculty-Student Disciplinary Committee, penalties that may be imposed include but are not limited to: 1) suspension from the College or 2) expulsion from the College. Although the Office of the Vice President for Student Affairs will be guided by the recommendation of the instructor, it reserves the right to seek disciplinary sanctions under the disciplinary procedures.

Should the instructor become convinced that the suspicions are unfounded, no further action will be taken and the Faculty Report Form will be destroyed. If the suspicions are founded and if both the student and the instructor are willing, they may agree upon a resolution. Subsequently the instructor will present the completed Faculty Report Form, including the charges and resolution, to the department chair who must forward the appropriate copies of the form to the Office of Academic Standards and Evaluation, and the Office of the Vice President for Student Affairs. If no agreement is reached, the instructor must allow a student to complete all coursework until the following appeal process has been completed.

- The first step in the appeals process is for the instructor to file the Faculty Report Form with the chair. If the term is completed, the instructor may assign a grade that reflects the intended sanction but must also provide a final grade that does not include the intended sanction if the charges are not upheld.
- If the charges are for cheating, then the chair will submit the charges to the Office of the Vice President for Student Affairs. If the charges are for plagiarism, the chair will appoint a committee of three Lehman College faculty members, which will adjudicate the matter within three weeks by majority vote. If the chair is the instructor in question, the senior member of the department Personnel and Budget Committee will act for the chair. The committee will provide written notification of its decision to the chair, who will forward this recommendation and the Faculty Report Form to the Office of the Vice President for Student Affairs.
- The Office of the Vice President for Student Affairs will review the recommendations of the instructor and the committee for possible disciplinary sanctions and provide a written notification of its decision to the department chair, the student, the instructor, and the Office of Academic Standards and Evaluation. Either the instructor or the student has the right, within three weeks of receipt of notification, to appeal the department decision in writing to the Committee on Admissions, Evaluation, and Academic Standards, which will act as adjudicator of last resort.

Should any part of the three-week period fall outside the regular semester, the first three weeks of the next regular semester shall apply.

The Office of Academic Standards and Evaluation will keep all records of such proceedings on file until the student's graduation, at which time they will be destroyed.

As a result of a second upheld charge of academic dishonesty, disciplinary procedures will be pursued by the Office of the Vice President for Student Affairs as governed by the procedures under Article 15 of the Board of Trustees' Bylaws.

The following definitions and examples are adapted from the CUNY Policy on Academic Integrity.

Cheating is the unauthorized use or attempted use of material, information, notes, study aids, devices, or communication during an academic exercise. Examples of cheating include, but are not limited to the following:

- Copying from another student during an examination or allowing another student to copy your work.
- Unauthorized collaboration on a take-home assignment or examination.
- Using illegal notes during a closed-book examination.
- Taking an examination for another student, or asking or allowing another student to take an examination for you.
- Changing a graded exam and returning it for more credit.
- Submitting substantial portions of the same paper for more than one course without informing each instructor.
- Preparing answers or writing notes in a blue book (exam booklet) before an examination.
- Allowing others to research and write assigned papers or do assigned projects, including the use of commercial term paper services.
- Giving assistance to acts of academic misconduct or dishonesty.
- Fabricating data (all or in part).
- Submitting someone else's work as your own.
- Unauthorized use during an examination of any electronic devices, such as cell phones, palm pilots, computers, or other technologies to send or retrieve information.

Plagiarism is the act of presenting another person's ideas, research, or writings as your own. Examples of plagiarism include, but are not limited to the following:

- Copying another person's actual words without the use of quotation marks *and* citations.
- Presenting another person's ideas or theories in your own words without acknowledging the source.
- Using information that is not common knowledge without acknowledging the source.
- Failing to acknowledge collaborators on assignments.
- Purchasing or downloading term papers online.
- Paraphrasing or copying information from the Internet without citing the source.
- "Cutting and pasting" from various sources without proper attribution.

Course topics

The following topics will be covered:

Periodic table; Covalent bonding; Models;Metallic Bonding; Ionic bonding; Solvents; Acid base behavior; Oxidation Reduction; Periodic Trends; Elements and their compounds.

Nr. Crt.	Subject
1.	**Chapter 1. The electronic Structure of the Atom** Quantum model Shapes of the atomic orbitals
2.	Polyelectronic atom; Magnetic properties of the atom
3.	**Chapter 2. An overview of Periodic Table** Organization of the modern Periodic Table Existence of the elements
4.	Isotopes Classification of the elements Periodic properties
5.	**Chapter 3. Covalent bonding** Models of covalent bonding Introduction to molecular orbitals Diatomic molecules
6.	Lewis Structure Partial Bond order Formal Charge VSEPR
7.	Intermolecular Forces Covalent Bonding across the Periodic Table
8.	**Chapter 4. Metallic Bonding** Metallic Bonding;
9.	Bonding models Unit cells;
10.	Alloys Magnetic Properties of Metals
11.	**Chapter 5. Ionic Bonding** The ionic Model and the Size of Ions Hydrogenated Salts
12.	Crystal structure Polyatomic Ions
13.	**Exam 1**
14.	**Chapter 7. Solvent Systems and Acid-Base Behavior** Solvents; Bronsted-Lowry Acids Bronsted-Lowry Bases
15.	Trends in Acid-Base reactions; Pearson Hard-Soft Acid base Concepts Applications
16.	**Chapter 9. Periodic Trends**

	Group trends Periodic trends in Bonding Isoelectronic series in Covalent compounds Isomorphism in Ionic Compounds Diagonal relationships
17.	**Chapter 10. Hydrogen and Chapter 11 The group 1 Elements** Properties of Hydrogen Hydrides Future of the Alkali Metal Compounds Solubility Salts
18.	**Chapter 12 The group 2 Elements: The Alkaline Earth Metals** Group trends Features of Alkaline Earth Metal Compounds Compounds Cermet Biomineralization – Biological aspects
19.	**Chapter13. The group 13 Elements** Group trends Borides; Aluminum Halides Aluminum Potassium sulfate Aluminides
20.	**Chapter14. The group 14 Elements** Group trends; Contrasts in the chemistry of Carbon and Silicon; Carbonates; Cyanides; Silicates Tin and lead compounds
21.	**Chapter15. The group 15 Elements : The Pnictogens** Group Trends Contrasts in the chemistry of Nitrogen and Phosphorous Chemistry of Nitrogen Phosphorous and its compounds
22.	**Chapter16. The group 16 Elements : The Chalcogens** Group Trends Contrasts in the chemistry of Oxygen and Sulfur Trends in oxide properties; Sulfur and its compounds; Acids;
23	**Exam 2**
24.	**Chapter17. The group 17 Elements : The Halogens** Group Trends; Contrasts in the chemistry of Fluorine and Chlorine; Overview of Chlorine chemistry; Oxoacids and Oxyanions;
25.	**Chapter18. The group 18 Elements : The Noble Gases** Group Trends; Helium

	Xenon Fluorides; Xenon Oxides; Other Noble Gas Compounds
26.	**Chapter 20. Properties of the 3d Transition Metals** Overview of the 3d Transition Metals; Elements and their compounds; Trends;
27.	**Chapter 21. Properties of the 4d and 5d Transition Metals** Comparison of Transition Metals; Overview of the 4d and 5d Transition Metals; Elements and their compounds; Trends;
28.	**Chapter 19. Transition Metal complexes** Introduction in transition metal complexes Nomenclature Stereochemistry
	Final exam

Lehman College
City University of New York
Department of Chemistry

Advanced Inorganic Chemistry CHE-443
Spring - 2019

Instructor

Professor Andrei Jitianu –PhD
Laboratory Instructor - Wong, Madeline
Office Hours: Wednesday 11:00-12:00 PM
Office: Davis Hall D-103
e-mail: andrei.jitianu@lehman.cuny.edu

Course Description
CHE-443 - **Advanced Inorganic Chemistry**,
Two lectures are offered twice per week – Monday and Wednesday 10:00-10:50 pm (11:00am)
One Laboratory of 6 hours are offered per week - Monday 11:00AM-4:50 PM
8 hours (2 lecture+6 laboratory) / 5 credits
Advanced studies in modern inorganic chemical theories on the interpretation and explanation of the properties, and relations between the elements, their compounds and structures.

Prerequisites

CHE 235, CHE 249 and 442.

Place of course in degree program

This course is a degree program requirement for BS in Chemistry, and Biochemistry program.

Academic or Learning Objectives

Student Learning Outcomes: After completing the lecture students should be able to:

- Carefully state and be able to apply the major basic concepts of inorganic chemistry. To understand the periodicity of chemical and physical properties
- Understand the chemical bonding and molecular structure using the main molecular models and to correlate theses with the molecular shape.
- Be able to apply the concepts of group theory in the spectroscopy of inorganic molecules.
- Understand the structure of the inorganic solids.
- Understand structure of coordination compounds, to write the chemical formulas of these and to know the main theories which explain the bonding in complexes and electronic spectra.
- Be able to write chemical equations in a precise, effective, and understandable way.

Student Learning Outcomes: After completing the Laboratory part students should be able to:

- to prepare simple inorganic compound which have various applications; to know to writhe the chemical equation of the prepared compounds; to know the structure of the prepared compounds
- to understand the principle that govern the synthesis of coordinative compounds.

- to understand the principle that govern X-Ray diffraction and to be able to identify the structure and the purity of the inorganic compounds.
- to understand the principle that govern the electronic spectra and to correlate those with the UV-VIS spectra of the coordinative compounds.
- to know how to survey the literature using **scientific** search engines

To know how to put together a scientific report in a journal paper format and how to make a scientific presentation.

Required Readings

Inorganic Chemistry Seven Edition, Edited by M. Weller, T. Overtone et al, at Oxford University Press, Oxford, UK 2018, ISBN- 978-0-19-876812-8

Inorganic Chemistry, Gary L. Miessler and Donald A. Tarr, Forth Edition Edited by Pearson Prentice Hall, New Jersey, ISBN: 0-1-36128661

For the laboratory section Handouts will be provide before each lab

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Course Requirements and Grading

For this class there will be 1 Midterm exams and a Final exam.
The final grade will be established as follows:

Exams 1	- 20%:
Final exam	- 20%
Laboratory reports	- 40%
Literature report	- 12%
Literature report presentation	- 8%

Each student's grade will be determined by counting each exam as 20% of the final grade. In the event a student misses the regular exam, the 20% for that exam will be included in the final exam. In other words, if a student were to miss **Exam 1**, the final grade and that student's final exam would count 40%.**No make-up exams will be given.**

No passing grade a student will obtain if:

- miss the Final Exam
- miss more than two experiments;
- not check out;
- not turn in the Literature report
- not present Presentation based on Literature Report

Laboratory Reports: - Laboratory reports are due one week after completion. One point (out of the maximum of one hundred) will be deducted for each day (or part thereof) that the report is late. The reports will be not accepted anymore after two weeks from the date when those were supposed to be turned in.

- The lab reports should
  - have a journal paper format
  - describe the experiments and contain all the chemical equations of the reactions done in the lab,
  - answer to the "Questions to be considered"
  - answer to all questions which will be given by the instructor before each laboratory.

- **No make-up laboratories will be given. This is in accordance with the chemistry department's policy.**

  - **Literature report:**
    - Literature report should be in the "Langmuir" journal format (should have Abstract, Introduction, eventually Experimental, Results and Discussion (or Results, Discussion) and Conclusion)
  - should have:
    - minimum 5 references from American Chemical Society Journals
    - minimum 4 references from Elsevier or Springer
    - and another 3 minimum references from other sources (books, journal edited by other editors).

  - **Literature report presentation:**
    - This will be based on the "Literature report". Each student will have a 10 minutes presentation in PowerPoint followed by 5 minutes of questions

The plagiarism will be not accepted. Each lab report will be scanned to identify plagiarism. <u>An identification of 30% plagiarism will consider a failure of the class</u>.

Attendance Policy

Students **MUST** be present at every class.

A student cannot miss more than one regular exam. For the final grade the presence at the Final Exam is compulsory.

The attendance to the laboratory is compulsory. A student cannot miss more than TWO laboratories. For the case of missing more than two laboratories the student will not receive a passing grade.

No make-up laboratories will be given. This is in accordance with the chemistry department's policy.

Accommodating Disabilities

Lehman College is committed to providing access to all programs and curricula to all students. Students with disabilities who may need classroom accommodations are encouraged to register with the Office of Student Disability Services. For more information, please contact the Office of Student Disability Services, Shuster Hall, Room 238, phone number, 718-960-8441.

Classroom Policy:

Food policy: Food and drinks are not allowed in the classroom.

Cell Phone Policy. Cell phones are disruptive, even in vibrate mode. Make sure your cell phones are in silent mode before class starts. Text-messaging during class is also highly disruptive (besides absolutely rude) and is forbidden. If a cell phone rings during class, lecture will be stopped, until the student will shut down the device and the following penalties are applicable

5 pts penalty if your cell phone rings while I am in class; **10 pts penalty** if you continue the disturbance (e.g., by letting it ring again); **15 pts penalty** for 1st ring on 2nd occasion;

Electronic devices Policy No electronic devices can be used or kept accessible during examinations; this includes, but is not limited to i-Phones, cell-phones, beepers, iPods, MP3 players, tape-recorders, PDAs, **bluetooth** and other computing or music devices. Only **basic** calculators will be allowed.

Academic Integrity

While honest scholarship is time-consuming and often requires hard work, it is also the primary process by which students learn to think for themselves. Faculty members must teach respect for methods of inquiry within the various disciplines and make assignments that will encourage honest scholarship; students in turn must uphold a standard of honesty within the College, thereby affirming the value and integrity of their Lehman degree. The following definitions and procedures govern cases involving undergraduate student work.

The most common forms of academic dishonesty are cheating and plagiarism. Cheating is the use or attempt to use unauthorized material, information, notes, study aids, devices, or communication during an academic exercise (for example, using unauthorized books, papers, or notes during an examination; or procuring, distributing, or using unauthorized copies of examinations). Plagiarism means the failure to give credit for the source of another's words or ideas, including but not limited to books, articles, interviews, and multimedia and electronic sites, or—as in the use of borrowed or purchased papers—passing off another person's work as one's own. (Section 213-b of the New York State Education Law prohibits the sale of term papers, essays, and research reports to students enrolled in a college.) Common forms of cheating and plagiarism are highlighted in this Bulletin.

Academic dishonesty is a serious violation of the accepted values of the College. When questions of a breach of academic integrity arise, instructors will inform the students of their suspicions and provide the student with a Faculty Report Form for Incidents of Suspected Academic Dishonesty. The instructor must remember that a student's failure to respond to charges of academic dishonesty is not in and of itself an indication of guilt. The report will include an explanation of the incident, the instructor's intended academic sanction, and an indication whether or not the instructor is recommending that the College undertake disciplinary proceedings pursuant to Article 15 of the Board of Trustees Bylaws.

Academic sanctions may include but are not limited to the following:

1. **a grade of F for the course**.

Disciplinary procedures are governed by Article 15 of the Board of Trustees Bylaws. In the event the student is found guilty of academic dishonesty by a Faculty-Student Disciplinary Committee, penalties that may be imposed include but are not limited to: 1) suspension from the College or 2) expulsion from the College. Although the Office of the Vice President for Student Affairs will be guided by the recommendation of the instructor, it reserves the right to seek disciplinary sanctions under the disciplinary procedures.

Should the instructor become convinced that the suspicions are unfounded, no further action will be taken and the Faculty Report Form will be destroyed. If the suspicions are founded and if both the student and the instructor are willing, they may agree upon a resolution. Subsequently the instructor will present the completed Faculty Report Form, including the charges and resolution, to the department chair who must

forward the appropriate copies of the form to the Office of Academic Standards and Evaluation, and the Office of the Vice President for Student Affairs. If no agreement is reached, the instructor must allow a student to complete all coursework until the following appeal process has been completed.

- The first step in the appeals process is for the instructor to file the Faculty Report Form with the chair. If the term is completed, the instructor may assign a grade that reflects the intended sanction but must also provide a final grade that does not include the intended sanction if the charges are not upheld.
- If the charges are for cheating, then the chair will submit the charges to the Office of the Vice President for Student Affairs. If the charges are for plagiarism, the chair will appoint a committee of three Lehman College faculty members, which will adjudicate the matter within three weeks by majority vote. If the chair is the instructor in question, the senior member of the department Personnel and Budget Committee will act for the chair. The committee will provide written notification of its decision to the chair, who will forward this recommendation and the Faculty Report Form to the Office of the Vice President for Student Affairs.
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- "Cutting and pasting" from various sources without proper attribution.

Lecture topics

The following topics will be covered:

Atomic structure and Periodic Trends; Molecular structure and bonding; Structure of the inorganic solids; Bonding and Molecular structure; Molecular Symmetry; Elements and their compounds; Coordinative compounds; Solid state and materials Chemistry; Nanomaterials;

Nr. Crt.	Subject
1	**Chapter 8. Physical techniques in Inorganic Chemistry** Diffraction methods X-ray Diffraction Neutron diffraction Absorption and emission spectroscopy
2.	Infrared and Raman Spectroscopy Ionization-based techniques Chemical analysis Thermal Analysis Microscopy
3.	**Chapter 1. Atomic structure*** Some principles of quantum mechanics*
4.	Heisenberg's uncertainty principle The structure of hydrogen atoms* Schrödinger equation* The particle in a Box*
5.	Atomic orbitals Shells, subshells and orbitals*
6.	Electron spin* The radial variation of atomic orbitals The angular variation of atomic orbitals
7	Many electron atoms Penetration and shielding The building-up principle
8.	Atomic parameters (radii variation; ionization Energy; Electron affinity; Electronegativity and Polarizability)
9.	**Chapter 2. Molecular structure and bonding**

	Molecular Orbital theory Principles of Molecular Orbital Theory
10.	The approximation of the theory - Homonuclear diatomic molecules - Heteronuclear diatomic molecules Structure and bond properties
11.	**Chapter 6. Oxidation and Reduction** Reduction potential; Standard Potentials and spontaneity Nernst Equation
12.	Redox Stability; The diagrammatic presentation of potential data Chemical extraction of the elements
13.	**Chapter 4. The structures of simple solids** The description of the structures of solids - Unit cells and the description of the crystal structure; The close packing of the spheres
14.	Holes in close-packed structures The structure of metals and alloys; Polytypism; Polymorphism in metals; Atomic radii of metals;
15.	Alloys and interstitials Intermetallic Compounds Ionic solids; The Energetic of ionic bonding
16	Defects and nonstoichiometry The electronic structure of the solids
17.	**Exam 1**
18.	**Chapter 24. Materials chemistry and nanochemistry** General principles of solid state chemistry Extended defects Defects and Ion transport Synthesis of materials Rechargeable battery materials
19.	Metal oxides - Oxied glasses - Framework structure Semiconductor chemistry Fullerides Nanomaterials; Inorganic-organic nanocomposites
20	**Chapter 3. Molecular Symmetry*** An introduction to symmetry analysis Symmetry operations*; Symmetry elements; The point groups of molecules
21.	Applications of symmetry Polar and Chiral Molecules*
22.	Symmetry of orbitals;

	The symmetry of molecular vibrations; Representations* The symmetry of molecular orbitals
23.	**Chapter 7. An Introduction to coordination compounds** Ligands and nomenclature
24.	Constitution and geometry; Coordination numbers Isomerism and chirality Formation constants
25.	**Chapter 20. *d*-Metal complexes: electronic structure and spectra** Electronic structure Crystalline field theory Jahn-Teller Effect*
26.	Octahedral versus tetrahedral coordination Ligand-field theory;
27.	Electronic spectra; Electronic spectra of atoms; Electronic spectra of complexes **Chapter 21 Coordination Chemistry: reactions of complexes;** Ligand substitution reactions; Ligand substitution in square-planar complexes
28	Ligand substitution in octahedral complexes Redox reactions Photochemical reactions
	Final exam

CHE-443 Advance Inorganic Chemistry Laboratory
2019 Spring Semester
Laboratory Instructor - **Wong, Madeline**

Please Note: This schedule is subject to minor change so that course material can be best presented. **All reading assignments are to be completed before class.**

Experiment	Date	Lab
1.	01/28/2019	**Dry Laboratory;** Surf the literature using the SciFinder Scholar; American Chemical Society Literature survey. Research topic for a literature report and presentation **Check-in** **Experiment 1.** Part I: Basicity of oxo Anions and Solubility of their Salt Part II: Competitive Lewis Acid-Base Reactions Part III: Hydrolysis of chlorides of various metal ions
2.	02/04/2019	Continuation of the **Experiment 1** **Experiment 2.** Preparation of Sodium Peroxobora**t**
3.	02/11/2019	**Experiment3.** Zeolite synthesis. Growing of a chemical garden Part I: Zeolite Synthesis

		Part II: Growing a chemical garden **Experiment 4.** The Synthesis and Characterization of Spinels
4.	02/25/2019	**Experiment 4.** The Synthesis and Characterization of Spinels – ***Continuation*** **Experiment 5.** Synthesis of ZnO nanoparticles
5.	03/04/2019**	**Experiment 6.** X-Ray Diffraction of zinc oxide nanoparticles** Training on the X-Ray diffractometer
6.	03/11/2019	**Experiment 7.** Copper Compounds Preparation of Potassium Trichlorocuprate (II); Preparation of Tris(thiourea)copper (I)
7.	03/18/2019	**Experiment 8.** Preparation of a Ferrofluid
8	03/25/2019**	**X-Ray characterization of** the Ferofluids and Spinels
9.	04/01/2019	**Experiment 9.** Preparation and Characterization of Sodium Tetrathionate PART I. Determination of Reaction Quantities PART II Quantitative Preparation of Sodium Tetrathionate PART III Characterization of the product
10.	04/08/2019	**Continuation of Experiment 9**
11.	04/15/2019	**Experiment 10.** Synthesis of a Heteropolytungstate and its Use in Outer-Sphere Redox Kinetics
12.	04/29/2019	**Experiment 11.** Ethylenediamine Complexes of Cobalt and Nickel
13.	05/06/2019	**Experiment 12.** Absorption spectra of Transition Metal Complexes **Literature report is due**
14.	05/13/2019	**PowerPoint presentations for each student** 10 minute for presentation and 5 minutes for questions and answers Check out

**The experiment will be run based on the availability of the X-Ray diffractometer. This experiment might be replaced with "CITING APPROPRIATELY LITERATURE ARTICLES" or other experiments

CHE-444 BIOCHEMISTRY I
Chemistry Department
Syllabus Fall 2019

COURSE INFORMATION

Course Number	**CHE-444**
Title	Biochemistry I
Class Room	Tu,Th 6:00–7:50 pm Room: Davis Hall 337
Credit Units	Three units
Career	Undergraduate
Prerequisites	Che 234 (Organic Chemistry Lecture II)

INSTRUCTOR INFORMATION

Instructor	Columba de la Parra, Ph.D.
E-mail	Columba.Delaparra@lehman.cuny.edu
Office hours	Thursday 3-4:30pm- New Science Hall-4402

COURSE DESCRIPTION AND OBJECTIVES

Welcome to Biochemistry I. Biochemistry is the chemistry of biological systems. It is a central science found at the intersection of biology, chemistry, physics, and medicine. This is the first course of a two-semester program in biochemistry. In this course, students will learn about amino acids, protein structure and conformation, kinetic and molecular basis of enzyme action, nucleic acids, lipids, and membrane structure, carbohydrates and intermediary metabolism, regulatory mechanisms, elementary thermodynamics in biochemical equilibria, relationships between structure and function of biological macromolecules and the principles of biochemical techniques. The metabolic pathways are covered in the separate course during the spring semester (CHE 446).

After completing this course students should be able to:

- Be proficient in relating the structure and chemical/physical properties of biological macromolecules with their biological function
- Demonstrate proficiency with vocabulary used in biochemistry
- Understand the principles of biochemical techniques
- Explained the kinetics of enzyme activity and how this can be regulated
- Understand the key differences between the major signal transduction pathways
- Describe the principles of glucose enzymatic reactions and bioenergetics of glucose metabolism

TEXTBOOK:

We will use the textbook: **Biochemistry by Roger L Miesfeld & Megan M McEvoy** (W.W.Norton & Company- ISBN: 978-0-393-61402-2) and **Lehninger Principles of Biochemistry by David L. Nelson** (ISNB: 1429234148)

ALTERNATIVE TEXTBOOKS:

Many other biochemistry textbooks cover the topics from the course and they provide valuable explanation on biochemistry concepts. These textbooks include but not limited to: *Voet et al. Biochemistry; Garrett et al. Biochemistry; Van Holde et al. Biochemistry*

HOMEWORK:

We will use **Smartwork5** which is an online homework and assessment system.
Self-enroll into the course: https://digital.wwnorton.com/biochem
ID: **149722,** CHE 444 - Biochemistry I – Fall 2019

- It should be noted that purchase of the textbook is not mandatory, but it is highly recommended. The Smartwork5 homework system will be set up for this particularly course. The textbook is a resource for the material we will cover. The exams are based on the material/topics we cover in class and on the related homework assignments.
- The Slides are the best guide for what you are expected to know for the exams. Lecture presentations will be made available via Blackboard system.
- **The homework is required.** The are online quizzes available for practice. The online quizzes are strongly recommended, not required.

GRADING POLICY:

Homeworks and In-class Quizzes*	25%
Midterm 1	25%
Midterm 2	25%
Final Exam**	25%
Total	100%

* Will be announced on blackboard ** The final exam is not cumulative. There will be no make-up exams.

GRADING SCALE:

93 – 100	A	73 – 76.9	C
90 – 92.9	A-	70 – 72.9	C -
87 – 89.9	B+	67 – 69.9	D+
83 – 86.9	B	63 – 66.9	D
80 – 82.9	B-	60 – 62.9	D-
77 – 79.9	C+	Below 60	F

COURSE OUTLINE:

Week	Topics	Homework Assignment
Week 1	Chapter 1: **Principles of Biochemistry** Chemical Bonds, functional groups in Biochemistry Chapter 2: **Physical Biochemistry** Energy Conversion, Thermodynamics of Life	SW Ch. 1
Week 2	Chapter 2: **Physical Biochemistry** Physical/Chemical properties of water, buffers, pH and Membranes Chapter 3: **Nucleotides; Chemistry, Structure and Function of Nucleic acids**	SW Ch. 2
Week 3	Chapter 3: **Nucleic Acid Structure and Function (cont.)** Methods in Nucleic Acid Biochemistry	SW Ch. 3
Week 4	Chapter 4: **Amino acids and Peptides** Chemical properties, peptide bond Chapter 4: **Protein Structure**	
Week 5	Chapter 4: **Protein Folding** Chapter 5: **Methods in Protein Biochemistry**	SW Ch. 4 & 5
Week 6	***Midterm 1: Topics from week 1 to 5***	
Week 7	Chapter 6: **Protein Function** (**part I)**	
Week 8	Chapter 6: **Protein Function** (**part II)** Transporting Oxygen- Hemoglobin: structure, function and allosteric control Chapter 6: **Protein Function** (**part III)** Membrane transport and structural proteins	SW Ch.6
Week 9	Chapter 7: **Enzymes** - Structure and function Chapter 7: **Enzymes-** Reaction mechanism and kinetics	
Week 10	Chapter 7: **Enzymes** -Regulation Chapter 8: **Cell Signaling System** (part I)	SW Ch.7
Week 11	Chapter 8: Cell Signaling System (part II) ***Chapter 13: Carbohydrates Structure and Function***	SW Ch.8
Week 12	***Midterm 2: Topics from week 7 to 11*** **Chapter 13: Biochemical Methods in Glycobiology**	SW Ch. 13
Week 13	Chapter 15: **Lipids Structure and Function** Chapter 15: Cell Membranes	SW Ch. 15
Week 14	Chapter 9: Overview of Metabolism	
Week 15	Chapter 9: **Glycolysis** Chapter 9: **Glycolysis (part II)**	SW Ch. 9
Week 16	Chapter 14: **Gluconeogenesis and the Pentose Phosphate Pathway**	SW Ch. 14
December 13-20	Final Exam ***Topics from week 12 to 16***	

IMPORTANT DATES

- Exams:
  - Midterm 1 Thursday, **October 3**
  - Midterm 2 Tuesday , **November 12**
  - Final Exam Tuesday, **Dec 17** 6:15pm-8:15pm

Deadlines HomeWorks- Smartwork5

Chapter	Topic	Deadline
Ch 1& 2	Principles of Biochemistry & Physical Biochemistry: Energy Conversion, Water, and Membranes	Sept 14
Ch 3.	Nucleic Acid Structure and Function	Sept 21
Ch.4 & 5	Amino acids-Protein Structure & Methods in Protein Biochemistry	September 28
Ch. 6	Protein Function	October 19
Ch. 7	Enzyme Mechanisms	November 2
Ch. 8	Cell Signaling Systems	November 9
Ch. 13 & 15	Carbohydrate and Lipid Structure and Function	November 23
Ch. 9	Overview of Metabolism Glycolysis	December 7
Ch. 14	The Pentose Phosphate Pathway Gluconeogenesis	December 14

Office of Registrar- Academic Events Calendar

October 1 Tuesday • No classes scheduled
October 8 Tuesday • No classes scheduled
November 28 • Thanksgiving Holiday
December 12 Thursday • Last day of instruction for Fall 2019
December 20 Friday • End of Fall Term December
December 27 Friday • All Grade Rosters are due

ACCOMMODATING DISABILITIES

Lehman College is committed to providing access to all programs and curricula to all students. Students with disabilities who may need classroom accommodations are encouraged to register with the Office of Student Disability Services. For more information, please contact the Office of Student Disability Services, Shuster Hall, Room 238, phone number, 718-960-8441.

ACADEMIC CENTER FOR EXCELLENCE (ACE) & SCIENCE LEARNING CENTER (SLC)

The Academic Center for Excellence (ACE) and the Science Learning Center (SLC) are two of the tutoring centers on campus. The ACE provides appointment based and drop-in tutoring in the humanities, social sciences, and writing, as well as general writing and academic skills workshops. The SLC provides drop-in tutoring for natural and computer science courses. To obtain more information about the ACE and the SLC, visit their website at http://www.lehman.edu/issp or call to ACE at 718-960-8175, and SLC at 718-960-7707.

ACADEMIC INTEGRITY AND PLAGIARISM POLICY

Statement may be found in student handbook. For more information refer to http://www.lehman.cuny.edu/student-affairs/documents/student-handbook-02.pdf.

Students found cheating will be brought on charges of academic dishonesty which can result in a F in the course and even suspension or expulsion from the college.

Department of Chemistry at **Lehman College City University of New York**

Biochemistry, CHE 446, Syllabus, Spring 2019

Lecturer: Cristina C. Clement, Ph.D., Chemistry Department, Lehman College, CUNY
Email:
cclement_us@hotmail.com; cristina.clement@lehman.cuny.edu;
cristina.clement@einstein.yu.edu; clement.cristina624@gmail.com
***Phone (cell):* 347-243-9023.**

Class Meetings: **Tuesday and Thursday from 5:30pm to 6:50 pm, Davis Hall 337.**

Office: **Davis Hall 318: Tuesdays and Thursdays after lab class or Saturday starting at 12:30 pm.**

The required textbook:

David L. Nelson• Michael M. Cox; Lehninger, Priniciples of Biochemistry, 4e, 5e, 6e, 7e-any of these editions are OK.

The Following are the recommended textbooks:

- *Biochemistry a Short Course, Second Edition, John L. Tymoczko, Jeremy M. Berg and Lubert Stryer*
- *Biochemistry – The molecular basis of life McKee and McKee 3rd or 4th Edition*
- *Lippincott's Illustrated reviews: Biochemistry Denise R. Ferrier*
- *Or the following On Line resource: http://www.ncbi.nlm.nih.gov/books/NBK21154/*

Website resources required:

http://courses.bfwpub.com/help/lehninger6e/Student/QuickStarts/lehninger6e_UserGuide.pdf

http://www.ncbi.nlm.nih.gov/books/NBK21154/

http://proteopedia.org/wiki/index.php/Main_Page

Other recommended Websites for Biochemitry ebooks:

Biochemistry, 2e by **Reginald Garrett and Charles Grisham - Brooks Cole.**

http://www.web.virginia.edu/Heidi/home.htm

The Structures of Life- National Institutes of Health, 2007

http://publications.nigms.nih.gov/structlife/
PROTEIN DATA BANK (PDB): *http://www.rcsb.org/pdb/home/home.do;*
The Structural Biology Knowledgebase: http://sbkb.org/
http://www.elmhurst.edu/~chm/vchembook/5900verviewmet.html
BRENDA: http://www.brenda-enzymes.org/

Course Description: This is a one-semester course in biochemistry covering all major metabolic pathways (catabolism and anabolism), integration of metabolism, DNA replication, repair and recombination, transcription and translation, gene expressions and regulation. Additional metabolic pathways specific for each organ and tissue in mammalian organisms will also be presented, including the action of hormones that regulate fuel metabolism; biochemistry of erythrocytes and other blood cells; liver metabolism; metabolism of the muscle cell at rest and during exercise; metabolism of the nervous system; extra-cellular matrix and connective tissue and blood coagulation and fibrinolysis. Most of the material is presented in formal lectures in conjunction with problem sets, ON-LINE access to different databases such as Protein Data Bank (PDB), Nucleic Acids Databank (NDB),NCBI and all metabolic pathways related databases:

Human Metabolome Database (HMD): *http://www.hmdb.ca,*
Small Molecule Pathway Database: *http://smpdb.ca,*
KEGG PATHWAY*: http://www.genome.jp/kegg/pathway.html,*
MetaCyc Metabolic Pathway Database*: https://metacyc.org/;*
International Union of Biochemistry and Molecular Biology on the Nomenclature and Classification of Enzymes by the Reactions they Catalyze.
http://web.expasy.org/pathways/
http://enzyme.expasy.org/
http://prosite.expasy.org/
https://cgap.nci.nih.gov/Pathways/BioCarta_Pathways

II. COURSE REQUIREMENTS AND GRADING

REQUIRED HOME WORK:
Sapling homework assessment for each work will be based on the material covered in-class. Homework assignment will be averaged with 3 midterms and then with the final exam.
!!! ***The Sapling registration provides you with the ebook of Lehninger, independent than the one provided by the Bookstore at Lehman College.***

How to set-up your Sapling account:

Students:
1. Go to http://saplinglearning.com and click on your country ("US Higher Ed" or "Canada") at the top right.
2a. If you already have a Sapling Learning account, log in and skip to step 3.

2b. If you have Facebook account, you can use it to quickly create a Sapling Learning account. Click the blue button with the Facebook symbol on it (just to the left of the username field). The form will auto-fill with information from your Facebook account (you may need to log into Facebook in the popup window first). Choose a password and timezone, accept the site policy agreement, and click "Create my new account". You can then skip to step 3.
2c. Otherwise, click the "Create an Account" link. Supply the requested information and click "Create My Account". Check your email (and spam filter) for a message from Sapling Learning and click on the link provided in that email.
3. Find your course in the list (you may need to expand the subject and term categories) and click the link.
4. If your course requires a key code, you will be prompted to enter it.
5. If your course requires payment, select a payment option and following the remaining instructions.
Once you have registered and enrolled, you can log in at any time to complete or review your homework assignments. During sign up or throughout the term, if you have any technical problems or grading issues, send an email to support@saplinglearning.com explaining the issue. The Sapling Learning support team is almost always faster and better able to resolve issues than your instructor.

EXAMS:

For this class there will be 3 mid-session assessments and a final exam that will contain both multiple choice and longer questions. The final grade will be established as follows:

Mid Term Exam 1	**15%**
Mid Term Exam 2	**15%**
Mid Term Exam 3	**15%**
Sapling Homework	**20%**
Final exam (has questions from midterm 1-3 and new material)	**20%**
Term Paper	**15%**

Due date: May 25th 2018

The subject of the term paper will be posted on Blackboard during the first week of classes.
No make-up exams will be given.

CHE 446 course objectives:

After successfully completing Biochemistry II (CHE 446) the student should be able to:

1. Comprehend fundamental concepts of biochemical energetics and metabolic pathways with a focus on the interactive nature of biological systems.
2. Explain how the metabolism of glucose leads ultimately to the generation of large quantities of ATP.
3. Describe how fats, nucleotides and amino acids are metabolized, and explain how they can be used for fuel.
4. Describe the structure of DNA, and explain how it carries genetic information in its base sequence.
5. Describe DNA replication.
6. Describe RNA and protein synthesis.

7. Explain how protein synthesis can be controlled at the level of transcription and translation.
8. Summarize what is currently known about the biochemical basis of cancer.
9. Explain the molecular signaling pathways.
10. Explain the molecular biology of cell division and development, cell motility and immune defense.

Key Topics

Weeks 1-4: Review of major metabolic pathways and organic chemistry mechanisms of biochemical reactions (handouts on blackboard).

Chapters 13, 14, 15: Cellular regulation of metabolism, bioenergetics and glucose metabolism: glycolysis, gluconeogenesis, glycogen breakdown and synthesis; pentose-phosphate pathway.

Review: biological membranes and signal transduction pathways (from Chem 444).

Week 4: Midterm I (1 hour 15 min hours exam) (chapters 13-15 and selected topics from biological membranes and signal transduction pathways).

Weeks 5-8:

Citric acid (TCA) cycle: Chap. 16: emphasis will be on the organic chemical transformations, and the molecular mechanisms of enzymes regulation: chemical modifications and allosteric control; anaplerotic reactions of TCA.

Lipid catabolism and biosynthesis Chap. 17 and 21: fatty acids ketone bodies and triacylglycerols (TAG) metabolism of phospholipids, glycosphingolipids and eicosanoid metabolism; cholesterol, lipoprotein and steroid metabolism.

Week 8: Midterm II (1 hour 15 min hours exam) (chapters 16, 17 and 21)

Weeks 9-10:

Introduction to "Nitrogen Metabolism. Amino Acids Metabolism: Catabolism and Biosynthesis. Chap. 18: emphasis will be on the organic chemical transformations, structure-function of the enzymes involved and their molecular mechanisms of regulation: chemical modifications and allosteric control.

Electron Transport Chain (ETC) and oxidative phosphorylation: Chap. 19: emphasis will be on structure-function of the proteins involved in the ETC and ATP synthesis, chemiosmotic theory and respiratory control of the oxidative phosphorylation; thermodynamic of the electron stransport reactions and ATP synthesis by F1Fo ATP synthase.

Weeks 11-12:

Nitrogen Assimilation, Biosynthetic Use, and Excretion & Introduction to “Nucleotides Metabolism”.

Purines and Pyrimidines Metabolism: Chap. 22.

Integration of Metabolism: Metabolic Effects of Insulin and Glucagon: Integration of Metabolism:

Vitamins: The feed and fast cycle. Chap. 23.

Week 12: Midterm III (1 hour 15 min hours exam) (chapters 18,19,22 and 23). No questions from chapter 20.

Weeks 13-14:

Gene and Chromosomes and the replication and transcription: DNA metabolism: Chap. 24, 25:***selected topics and subchapters.***

Translation, Protein Synthesis and Degradation (Protein turn-over): Chap.26, 27. ***selected topics and subchapters.***

Regulation of Gene Expression and Cancer Biology: Biotechnology and Human Diseases:

Chap. 28. ***selected topics and subchapters.***

Final Exam: 3 hour exam: Chapters 24-28 (selected subchapters when indicated) and selected questions from midterms 1-3.

Grading: Each student is required to take three one-hour &15 min examinations and one three hour final exam in addition to completing the term paper and the Sapling homework.

Grade Assignments:

100%-92% = A; 91.9%-85% =A-; 84.9%-78% = B+; 77.9%-73% = B; 72.9%-69% = B-

68.9%-63% = C+; 62.9%-58% = C; 57.9%-52% =C-; 51.9%-45% = D; Below 45% = F

Department of Chemistry at Lehman College City University of New York

Biochemistry CHE 447 (Biochemistry Laboratory) Syllabus, Spring 2019.

Instructor: Cristina C. Clement, Ph.D., Chemistry Department, Lehman College, CUNY; Cell: 347-243-9023.

Email: cclement_us@hotmail.com; cristina.clement@lehman.cuny.edu; ; clement.cristina624@gmail.com

Required textbooks:

Rodney Boyer (2012). *Biochemistry Laboratory: Modern Theory and Techniques; 2nd Edition.* Pearson, Prentice Hall, USA.

Other recommended textbooks:

Alexander J. Ninfa and David P. Ballou (2010). *Fundamental Laboratory Approaches for Biochemistry and Biotechnology; 2nd Edition.* John Wiley & Sons, Inc., USA.

Shawn O. Farell and Lynn E. Taylor (2006). *Experiments in Biochemistry: A Hands-On Approach; 2nd Edition.* THOMSON/Brooks/Cole, USA.

Handouts will be provided for each experiment with details for the experimental design and procedures. In addition, examples of previous lab reports from the students who passed Chem 447 will be posted on blackboard-on line.

CLASS MEETINGS

Tuesday and Thursday, 7:00 – 9:50 pm, Davis Hall room 026

COURSE OBJECTIVE

The primary objective of this course is for students to (1) learn fundamental approaches for experimentally investigating biochemical problems, (2) learn the theoretical foundations for the methods used, and (3) understand the applicability of the biochemical methods to realistic situations.

Topics covered in this course include methods for the isolation, UV-VIS of proteins and nucleic acids, purification, and characterization of proteins and nucleic acids, DNA recombinant technology,

characterization of enzyme kinetics; and manipulation of macromolecular structures from databases using contemporary visualization software.

Laboratory Hazards

Some of the chemicals used in this laboratory are harmful if inhaled or ingested.

 Always wear safety glasses in the Biochemistry Laboratory! Reading eye glasses no longer suffice as suitable safety protection for the eyes.

 Wear suitable clothing in the Biochemistry Laboratory. Sandals and shorts (unless covered by a lab coat) are not permitted in the lab.

 Wear latex gloves when working with dangerous biochemicals.

 Do not allow laboratory chemicals to enter your mouth or small cuts or scratches on your hands. Latex gloves are available for daily use to avoid this problem and to prohibit contamination of laboratory experiments.

 Do not inhale powders or vapors. This is especially important when working with sodium dodecyl sulfate (SDS) powder, concentrated acids/bases, and mixtures of acrylamide and bisacrylamide solutions.

 It is good practice to wash your hands carefully before leaving the laboratory.

Laboratory Notebook Maintenance

 All experimental data, except instrument output, should be recorded in indelible ink in a bound laboratory notebook with pre-printed sequential page numbers.
 Students should sign the notebook on the last page of that day's experiment.
 Do not leave blank pages in a laboratory notebook.
 A lab notebook should include protocols, identification of samples, observations, and data.
 Record data and observations as you obtain or make them. Do not write on scraps of paper with the intention of transferring information to the lab notebook later.
 Do not worry if your notebook is a little messy.
 The recording and organization of a permanent record of laboratory observations is as important a technique to master as any of the experimental methods you learn. The research notebook is a day-by-day record of the progress of experimental work. It should reflect the integrity and honesty of the experimenter as well as the clarity of his or her thought.

Cleanliness

It is important to maintain cleanliness in this laboratory. Even minor impurities on the glassware or on the pipette tip may ruin an otherwise well-done biochemical experiment. For example, using the same pipette tip to transfer two enzymes from their containers into your microcentrifuge tube will most surely contaminate the stock of the second enzyme with the first one and will likely ruin the results for the whole class. You will be working a lot with pipettes that use disposable tips. Discard the tip as soon as you do not need it. They are a lot cheaper than the chemicals that you are working with. Most used plasticware, such as microcentrifuge tubes or Falcon tubes (15 mL, 50 mL size) are 5 for one-time use. Empty all the tubes before discarding them (it's OK to leave less than 50 µL in microcentrifuge tubes). Discard broken glassware and used glass pipets into the red container. Do not discard functional glassware or any parts of the equipment used. If your glassware is visibly dirty, wash it with soap and hot water, otherwise rinse several times with distilled water from the tap, and place on the drying racks. **Do not leave any dishes in the sink**.

On average, the students will perform 2-3 experiments /week (6 hours lab work/week).
The following videos are required for the class:
http://www.bio-rad.com/webroot/web/html/lse/support/tutorial-bradford-assay-wndw.html
http://www.bio-rad.com/webroot/web/html/lse/support/tutorial_micropipet_wndw.html
http://www.bio-rad.com/webroot/web/html/lse/support/tutorial-titration-of-acids-and-bases-wndw.html
http://www.bio-rad.com/webroot/web/html/lse/support/tutorial-sds-page-of-fish-muscle-wndw.html
http://www.bio-rad.com/webroot/web/html/lse/support/tutorial-hic-chromatography-wndw.html

Key Topics and Experimental Work

Weeks 1-2: Check in and Chapters 1- 3&7 from Rodney Boyer's Biochemistry Laboratory.

Required reading: Chapters 1-3 & 7, **Rodney Boyer (2012).** ***Biochemistry Laboratory: Modern Theory and Techniques; 2nd Edition.***

Chapter 1: Introduction to the Biochemistry Laboratory: safety in the laboratory; keeping records and communicating experimental results; using biochemical reagents and solutions; quantitative transfer of liquids; statistical analysis of experimental data.

Chapter 2: Using the computer Internet for research in Biochemistry Lab: Web Sites useful in Biochemistry/Macromolecular structures (PDB and NDB, Expasy Molecular Biology/Proteomics tools/Metabolic pathways (KEGGS and Human Metabolome databases).

Additional databases of interest for the bioinformatics: ***Pharmit*** with ***ChEMBL/MolPort/ZINC*** **databases** (pharmit.csb.pitt.edu) and ***AutoDock Vina*** **molecular docking.**

Chapter3: General Laboratory procedures: pH, Buffers, amino acids titrations.

Experimental work: weeks 1-2

Experiment 1: Biochemical buffers, selection of a biochemical buffer. Preparation of buffers.

Students are required to prepare some biochemical buffers: such as 0.01M Tris-HCl, pH 7.4.

Experiment 2: Titrations of selected amino acids. In this experiment you will titrate 3 known amino acids: one neutral (such as alanine, valine, leucine or others), one acidic (glutamate or aspartate) and one basic (arginine or lysine). You will required to determine their pI, pK acid, pK amine and pK of the side chains and compare your values to the values reported in the literature.

Experiment 3: Identification of all 20 natural amino acids by thin layer chromatography (TLC) and reaction with ninhydrin.

Experimental work: weeks 3-4

Experiment 4: UV-VIS spectroscopy of proteins and nucleic acids.

I)Measurement of protein concentration in solutions using VIS absorption spectroscopy: Bradford and BCA assays (use BSA to construct calibration curve and interpolate the concentration of unknowns).

-Got Protein? Kit 1662900EDU: from Biorad is used for an independent Bradford assay.

II) Use the UV-VIS spectrophotometer Perkin Elmer to acquire the UV spectrum (from 200nm to 340 nm) of bovine serum albumin (BSA) and/or other proteins (lysozyme, carbonic anhydrase, peroxidase, beta-lactoglobulin and others).

1. Determine the protein concentration measurements from UV measurements and construct a calibration curve from the absorption at 280 nm of different known concentrations of BSA or other proteins and use the calibration curve to determine the unknowns concentrations.

2. Molar extinction coefficient determination for BSA from experimental UV measurements. Use the molar extinction coefficient to determine the concentration of an unknown sample of BSA and other proteins. Compare the molar extinction coefficients experimentally determined with the one determined from the amino acid sequence using the “Proteomics” server at the Expasy database.

II) UV spectroscopy of nucleic acids:

- Record the UV-scan of different nucleoside triphosphates (NTPs and dNTPs), nucleotide diphosphates (NDP), monophosphates (NMP) between 200nm-340 nm and use the Perkin Elmer software to assign the UV-maxima.

-Determination the molar extinction coefficients of different dNTPs/NTPs/NDP/NMP.

Weeks 5-6:

A) Purification and analysis of biomolecules by different chromatographic methods.

B) Characterization of proteins and nucleic acids by gel electrophoresis.

Theoretical background: Partition versus Adsorption Chromatography; Column Chromatography: The theory of electrophoresis; Methods and practical aspects of electrophoresis. Immuno-adsorption, immune-elctrophoresis and enzyme-linked immunoassays (ELISA).

Required reading: Chapters 5, 6 &9, **Rodney Boyer (2012).** ***Biochemistry Laboratory: Modern Theory and Techniques; 2nd Edition.***

Experimental work: Practical Aspects of Column Chromatography:

I) Gel-exclusion Chromatography:

1. Size Exclusion Chromatography **Kit 1660008EDU-Biorad**: first experiment.
2. Purification & Size Determination of Blue & Green Fluorescent Proteins by Gel-Filtration Chromatography, (Edvotek kit# 255 and handouts)-second experiment.

II) Ion Exchange chromatography (IEC):

Purification of the Restriction Enzyme *Eco* RI using ion exchange chromatography (Edvotek kit #302 and handouts)

II) SDS-PAGE electrophoresis for proteins identification.

SDS-PAGE analysis of the protein fractions from *EcoRI* enzyme experiment and from the green/blue/ fluorescence proteins purified by gel filtration. Protein staining in gels using Coomassie /Colloidal Blue and/or silver staining methods.

I**V) Agarose gel electrophoresis for nucleic acid identification.**

Analyze the activity of the purified EcoRI enzyme using agarose gel electrophoresis of lambda DNA digestion products (agarose gel electrophoresis and ethidium bromide/methylene blue staining of the nucleic acids bands).

Week 7: immunochemical technologies.

Practical aspects of immunochemical methods: Enzyme linked immunosorbent technologies (ELISA):

1. **ELISA Immuno Explorer™ Kit 1662400EDU: Biorad-1st experiment.**
2. **Quantitative ELISA. Cat. #278 Edvotek -2nd experiment.**

Weeks 8-10: Introduction to protein expression, purification and enzymology: Theoretical background: Theory of enzyme action, Michaelis-Menten kinetics, enzyme inhibition.

Required reading: Chapters 8, Rodney Boyer (2012). ***Biochemistry Laboratory: Modern Theory and Techniques; 2nd Edition and handouts.***

Experiment 1: Protein Expression and Purification Series – Hand-packed Purification Process #1665045EDU: Expression, purification and **enzyme kinetics of dihydrofolate reductase (DHFR).**

Experiment 2: Understanding catalytic activity of enzymes and optimum temperature/pH.

- ***2.1.*** **Biofuel Enzyme Kit, # 1665035EDU**
- ***2.2.*** **Recombinant beta-lactamase from MTB: enzyme kinetics and inhibition.**

(I) Comparative proteomics (I): Protein Profiling module: (Biorad kit 166-2700EDU).
-Protein extraction from muscle of different fishes.
-Electrophoresis: SDS-PAGE and agarose gel electrophoresis for profiling the proteins extracted from muscle.
-Gel scanning and bioinformatics introduction for the creation of cladograms.
(II) Comparative proteomics (II): WESTERN BLOT module (Biorad kit 166-2800EDU).
-Protein extraction from muscle.
-Electrophoresis: SDS-PAGE.
-Western blotting and immune-detection of the myosin light chains.

Weeks 11-12: Molecular Biology: Recombinant DNA technology

Theoretical background: Recombinant DNA technologies.

Required reading: Chapters 9&10, Rodney Boyer (2012). ***Biochemistry Laboratory: Modern Theory and Techniques; 2nd Edition.***

Experimental work:

1. Restriction Digestion and Analysis of Lambda DNA Kit **1660002EDU Biorad.**
2. Forensic DNA Fingerprinting Kit **1660007EDU**
3. Mitochondrial DNA Analysis Using PCR, Cat#332 Edvotek.

Week 13: Final review of all experiments, bioinformatics and check-out.

Methods of Evaluation:

Students are evaluated on their attendance, attitude, and participation in laboratory discussions, research and lab reports. Participation includes reading and evaluation of assigned literature, planning and execution of experiments, analysis of the resulting data, and preparation of oral or written reports.

Required presentations of reports

The purpose of the laboratory report is to communicate experimental work in writing. The educational goal is to help students learn and practice expressing their ideas and describing their work in a professional manner. The requirements for the structure of the laboratory report are similar to those for peer-reviewed scientific literature:

Students are required to present the reports as "*Journal of Biological Chemistry"*-type of written paper.

Requirements: CD/emailed/electronic back-up of all reports; Organic-chemistry notebooks like.

All reports will be sent to:

cclement_us@hotmail.com; cristina.clement@lehman.cuny.edu;
clement.cristina624@gmail.com

Paper Format:

Abstract: maximum 1 page

Introduction (1-2 pages): Methodology theory: physical-chemical background of the specific method you have used; use all hand-outs, other resources, books of analytical chemistry and biochemistry; use diagrams, pictures of the instrumental set-up, all chemical reactions described in detail, use the pictures and presentations from different companies which provided you the instrumentation for the specific method you described.

Materials and Methods (3-4 pages): present all details of calculation, mathematical treatment of data, the real experimental procedures you have used for that specific lab; use pictures, diagrams, mathematical formulas to show all the data (all calculations for concentrations, all solvents and buffers used in chromatography, all the details related to spectroscopic measurements, details of sample preparation and sample analysis by SDS-PAGE, agarose gel electrophoresis for nucleic acids, all details related to the elution methods used in ion exchange chromatography and gel-filtration, etc). Describe details of enzyme kinetics for each enzymatic assay, calculation of km, vmax, kcat and Ki (inhibitory constant).

Results (unlimited number of pages): Show all results as graphs, pictures, tables; all UV-scans, all extinction coefficient determination, all gel-photo documentations properly labeled, the chromatograms showing the A (595 nm) =f (fraction number), as described by each handout accompanying the experiment.

Discussions and Conclusions (unlimited number of pages): Discuss the results carefully, focusing on the analytical part of the method, explaining details of the findings related to molar extinction coefficients, assess the success of the chromatographic method by inspection of the SDS-PAGE gels and the output of the chromatograms; or in the case of the nucleic acids, describe the success of the restriction analysis using the required photo documentation of the agarose gel stained with ethidium bromide or methylene blue. Describe the type of inhibition you observed with provided compounds in the case of enzyme inhibition. Describe the advantages of the immunochemical methods vs classical methods for analyzing the proteins and protein-protein interactions. Describe the selectivity and the sensitivity of the new recombinant DNA technologies applied to the understanding of molecular pathology. Provide details of all the bioinformatics resources used from the available internet websites.

Grading

Your grade will be based on the number of points you earn out of 1000 total points. There are 10 lab write-ups worth 100 points each.

Grade Assignments:

100%-93% = A; 92%-88% =A-; 87%-83% = B+; 82-80% = B 79%-75% = B-; 74%-70% = C+; 69%-65% = C; 64%-60% =C-; 59%-55% = D; Below 55% = F

Lehman College
City University of New York
Department of Chemistry

Instrumental Analysis CHE-449
Fall - 2018

Instructors:
Professor Andrei Jitianu – PhD
Office Hours: Wednesday 1:30-2:30 PM
Office: Davis Hall D-103
e-mail: andrei.jitianu@lehman.cuny.edu
Professor Benjamin Burton-Pye – PhD
Office Hours: Tuesday 2:00-3:00 PM
Office: Davis Hall D322
e-mail: benjamin.burtonpye@lehman.cuny.edu
Professor Naphtali O'Connor – PhD
Office Hours: Thursdays: 10:30-11:30 am
Office: Davis Hall D-107
e-mail: naphtali.oconnor@lehman.cuny.edu

Course Description
CHE-449 – **Instrumental Analysis**,
Two lectures are offered twice per week Monday and Wednesday 10:00 – 10:50 AM
A laboratory is offered once per week – Monday 11:00 - 4:30 PM
8 hours / 5 credits

Electroanalytical, spectrophotometric, chromatographic, and other instrumental methods as applied to analytical chemistry.

Corequisites or Prerequisites:
CHE 344 and 345

Place of course in degree program
This course is a degree program requirement for Chemistry, and Biochemistry BA and BSc programs.

Academic or Learning Objectives
Student Learning Outcomes: Understand the principles involved in chemical instrument design.
After completing this course students should be able to:

- Identify and name the major instrumental methods,
- Define components and operation of modern chemical instrumentation,
- Understand theoretical background of instrument designs
- Interpret results acquired from various chemical instrumentation,
- Assess the benefits and limitations of different instrumentation methods and instrumental components,
- Identify appropriate instrumental methods for a chemical analysis

- Record experimental data and results in a manner in which it can be read and understood by anyone having a basic knowledge of analytical chemistry,
- Summarize experimental results in concise reports that meet the requirements.
- Effectively read and understand manuscripts on analytical instrumentation and method development

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Required Readings

Principle of Instrumental Analysis Seven Edition, by D. A. Skoog, F.J. Holler, S.R Crouch, at Cengage Learning, 2016, ISBN: 978-1-305-57721-3

Course Requirements and Grading

For this class there will be five laboratory reports and two exams
The final grade will be established as follows:

Laboratory reports - 80% (each experiment 16%):
Exam(s) - 20% (midterm (10%) and final exam (10%))

No make-up exams will be given.

Laboratory Reports: - Laboratory reports are due one week after completion. One point (out of the maximum of one hundred) will be deducted for each day (or part thereof) that the report is late. The reports will be not accepted anymore after three weeks from the date when those were supposed to be turned in.

- The lab reports should:
  - have a journal paper format ACS Analytical Chemistry (an example of the Analytical Chemistry article will be distributed by the instructor in the first day of the laboratory)
  - describe the experiments and contain all the chemical equations of the reactions done in the lab,
  - answer to the "Questions to be considered"
  - answer to all questions which will be given by the instructor before each laboratory.

Attendance Policy

Students **MUST** be present at every class and lab.
A student cannot miss any of the exam. For the final grade the presence at the Final Exam is compulsory.
The attendance to the laboratory is compulsory. A student cannot miss more than two laboratories. For the case of missing more than two laboratories the student will not receive a passing grade. **No make-up laboratories will be given. This is in accordance with the chemistry department's policy.**

Accommodating Disabilities

Lehman College is committed to providing access to all programs and curricula to all students. Students with disabilities who may need classroom accommodations are encouraged to register with the Office of Student Disability Services. For more

information, please contact the Office of Student Disability Services, Shuster Hall, Room 238, phone number, 718-960-8441.

Classroom Policy:

Food policy: Food and drinks are not allowed in the classroom.

Cell Phone Policy. Cell phones are disruptive, even in vibrate mode. Make sure your cell phones are in silent mode before class starts. Text-messaging during class is also highly disruptive (besides absolutely rude) and is forbidden. If a cell phone rings during class, lecture will be stopped, until the student will shut down the device and the following penalties are applicable

> **5 pts penalty** if your cell phone rings while I am in class; **10 pts penalty** if you continue the disturbance (e.g., by letting it ring again); **15 pts penalty** for 1st ring on 2nd occasion;

Electronic devices Policy No electronic devices can be used or kept accessible during examinations; this includes, but is not limited to i-Phones, cell-phones, beepers, iPods, MP3 players, tape-recorders, PDAs, **bluetooth** and other computing or music devices. Only **basic** calculators will be allowed.

Academic Integrity

For the college's policy towards academic integrity see the Lehman Undergraduate Bulletin. Students found cheating will be brought on charges of academic dishonesty which can result in a F in the course and even suspension or expulsion from the college. http://www.lehman.edu/lehman/about/policies_pdf/CUNYAcademicIntegrityPolicy.pdf

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Course topics

The following topics will be covered:

Vibrational Spectroscopy (FT-IR and Raman); Absorbance Spectroscopy, Fluorescence Spectroscopy, Gas Chromatography, Gas Chromatography- Mass Spectroscopy, High Preformance Liquid Chromatography, Electrochemistry (Cyclic Voltammetry).

Nr. Crt. Date	Subject
1. 08/27	**Chapter 5 Signal and Noises** - The signal – to noise ratio - Source of noises in instrumental analyses - Signal to Noise enhancement
2. 08/29/2018	**Chapter 16 An introduction to Infrared Spectroscopy** - Theory of IR absorption spectroscopy - IR instrumentation
3. 09/05/18	**Chapter 16 An introduction to Infrared Spectroscopy (*Continuation*)** - IR sources and transducers **Chapter 17 Application of IR Spectrometry** - MID-IR Absorption Spectrometry

4. 09/12/18	- MID-IR Reflection Spectrometry **Chapter 18 Raman Spectroscopy** - Theory of Raman Spectroscopy - Instrumentation o SERS
5. 9/17&24	**Chapter 2 Basic electronics & Chapter 4 Digital Electronics** **Chapter 14 An introduction to UV-Visible Spectroscopy** - Theory of UV-Vis Spectroscopy - UV-Vis instrumentation
4. 9/26 & 10/1	**Chapter 15: Molecular Luminescence Spectrometry** - Theory of Fluorescence and Phosphorescence - Instruments for Measuring Fluorescence and Phosphorescence
5. 10/3&10	**Chapter 15: Molecular Luminescence Spectrometry** - Instruments for Measuring Fluorescence and Phosphorescence - Applications of Photoluminescence - Advances of Fluorescence and Phosphorescence
6. 10/15&17	**Chapter 19 An Introduction to NMR** - Theory of NMR - NMR instrumentation including MRI
7. 10/22&24	**Chapter 19 Nuclear Magnetic Resonance Spectroscopy** - Application of Proton NMR - Carbon-13 NMR - Application of NMR to Other Nuclei - Multi-pulse and Multidimensional NMR
8. 10/29&31	**Midterm Exam** **Chapter 26: Introduction to Chromatographic separations**
9. 11/5&7	**Chapter 28 Introduction to Liquid Chromatography** - Liquid Chromatography-HPLC, UPLC - Instrumentation of HPLC
10. 11/12&14	**Chapter 20 Introduction to Mass Spectrometry** - Instrumentations –MS - Applications of LC-MS - Advances of LC-MS
11. 11/19&21	**Chapter 27 Gas Chromatography** - Principles of GLC - Instruments for GLC
12. 11/26&28	**Chapter 27 Gas Chromatography and GCMS** - GC columns and stationary phases - Applications of GC - Advances in GC
13. 12/3&5	**Chapter 22 An introduction to Electroanalytical Chemistry** - Theory of electrochemistry - Instrumental considerations - Applied Experimental conditions
14. 12/10&12	**Miscellaneous aspects of Instrumental Analysis**
	Final exam

CHE-449 Instrumental Analysis Laboratory 2018 Fall Semester
Please Note: This schedule is subject to minor change so that course material can be best presented. **All reading assignments are to be completed before class.**

Nr. Crt.	Date	Lab
1.	08/27/18	**Check-in** **Discussions about lab reports**
2.	09/05/18	**Exploring Resolution, Signal and Noise using an FT-IR spectrometer**
3.	09/17/18	**Building a UV-Vis Spectrometer**
4.	09/24/18	**Building a UV-Vis Spectrometer** *(Continuation)*
5.	10/1	**Building a UV-Vis/fluorescence Spectrometer**
6.	10/15	**Fluorescence Spectrometry – method development and instrumental design. NMR demonstration.**
7.	10/22	**Investigating Gas Chromatography**
8.	10/29	**Investigating Gas Chromatography**
9.	11/5	**GC-MS Analysis of Fatty Acid Methyl Esters in Egg Yolk**
10.	11/12	**GC-MS Analysis of Fatty Acid Methyl Esters in Egg Yolk**
11.	11/19	**Analysis of Caffeine using LC**
12.	11/26	**Analysis of Caffeine using LC**
13.	12/3	**Electrochem**
14.	12/10	**Electrochem and checkout**

CHE450: Chemistry Seminar

Spring 2019

Class meets: Wednesday 2:30-3:30pm, 1403HN

Instructor: Professor Donna McGregor, 304 Davis
Office Hours: by appointment only
Email: donna.mcgregor@lehman.cuny.edu

Goal of the course: CHE450 is a 1 credit seminar course designed to expose you, as an undergraduate student, to the multiple facets of scientific research through a series of science seminars. The semester will consist of a combination of research seminars and a discussion of a variety of research based topics. We will also devote some time to thinking about careers in science and what it means to think critically about scientific writing or presentations.

Text: All required reading material will be made available

Grade in the course: Your course grade will be based on your attendance, active participation in the class and the completion of a final written report.

Activity	Grade	de breakdown
Total Points	00	

Attendance and participation: (70% of grade) There are 14 required class meetings this semester. You must attend all 14 sessions to earn your participation grade. Each session is worth 3% of your grade. Your active participation is required in at east 7 of these sessions. Each session in which you actively participate is worth 4% of your grade for a total of 28%.

Final written report: (30% of grade) At the end of the semester you will be required to write a 1- to 2-page written report describing in more detail one of the areas of research that you were introduced to during the semester. This might include a general overview of the type of research conducted by one of the faculty run research labs in the chemistry department at Lehman, or a more detailed analysis of only one the of specific research projects that were presented during the semester. You may also feel free to write about scientific research that you have been involved in, either at Lehman or at an outside institution. We will discuss this assignment in more detail as the semester progresses. This report will be due on Wednesday May 16th.

Tentative Class Schedule

Date	Class Meeting Details
Jan 31	Introduction to the course
Feb 6	Faculty seminar: Prabodhika Malikaratchy (Lehman College)
Feb 13	Faculty seminar: Lauren Marbella (Columbia University)
Feb 20	Graduate student seminar: Shejla Pollozi (Lehman College)
Feb 27	Postdoctoral researcher seminar: Lina Freage (Lehman College)
Mar 6	Faculty seminar: Xi Chen (City College & Advanced Science Research Center)
Mar 13	Faculty seminar: Lisa Shah (Stony brook Univeristy)
Mar 20	Discussion about how to assess and discuss scientific presentations **Sweeney Lecture on Friday Mar 22nd.**
Mar 27	Faculty seminar: Wilfredo Colon (Rensselaer Polytechnic Institute)
April 3	Faculty seminar: Colin Abernathy (Sarah Lawrence College)
April 10	Faculty seminar: Brian GIbney (Brooklyn College)
April 17	Discussion about Fnal Written Report **Lehman Undergrad research conference on Monday April 15th**
April 24	**SPRING BREAK: NO CLASS**
May 1	Faculty Seminar: Julie Arslangu (Metropolitan Museum of Art)
May 8	Faculty Seminar: Elia Axinia (Lehman College) **Wrap up and final written report submission**