

HANDBOOK FOR MAJORS

(updated October 2013)

COLLEGE of
CHARLESTON

DEPARTMENT OF
CHEMISTRY
AND BIOCHEMISTRY

<http://chemistry.cofc.edu/>

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FACULTY

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Chair: Pam Riggs-Gelasco, Ph.D., gelascop@cofc.edu

Dean, Sciences & Mathematics: Michael J. Auerbach, Ph.D., auerbachmj@cofc.edu
Associate Dean, Sciences & Mathematics: James P. Deavor, Ph.D., deavorj@cofc.edu

This catalog is not a contract. The College of Charleston reserves the right to change programs of study, academic requirements, and College policies at any time, in accordance with established procedures, without prior notice.

WELCOME TO THE DEPARTMENT

Welcome to the Department of Chemistry and Biochemistry at the College of Charleston. The teaching of chemistry has been a part of the College of Charleston curriculum since its founding over 230 years ago. The Department offers the following degrees: BA in chemistry, BS in chemistry, and BS in biochemistry. A student may receive a certified degree from the American Chemical Society by completing a BS in either chemistry or biochemistry. An environmental chemistry emphasis is also offered. Students majoring in other disciplines may obtain a minor in chemistry. We feature a faculty that has as its primary focus the teaching of undergraduates and who value teacher- student interaction. We are recognized throughout the Southeast for the quality of our program, the dedication of our faculty, and the success of our students. In terms of the number of majors graduated in the 1990 and early 2000's we are the second largest public baccalaureate- degree only department in the United States, and yet our largest classes have approximately 50 students. We emphasize hands-on use by our students of modern instrumentation. Our graduates readily find acceptance to graduate and professional schools or placement in the chemical industry. Students going on to graduate school typically receive fellowships in excess of \$24,000 and are accepted to graduate programs throughout the southeast and beyond. In conjunction with the School of Education students may also complete a degree leading to certification for teaching in secondary education. All students receive the finest of liberal arts educations.

Our department values undergraduate research. This experience usually leads to students making presentations at professional meetings and being co-authors on publications in respected scientific journals. Paid summer research positions are available. There are also internship and coop opportunities with local industry for qualifying students.

Chemistry is the study of matter, its composition, properties, and transformations. It is often called the "central science" as it lies at the heart of most modern science and technology. A career in chemistry will provide you with challenges and offer you great potential to benefit society. This department will strive to help to prepare to meet those challenges.

A BRIEF HISTORY OF THE DEPARTMENT

Instruction in Chemistry has been a part of the program of studies at the College of Charleston from its very founding. The recommendation to the General Assembly of South Carolina in 1770 for the establishment of a college in Charles Town included in its provisions for a faculty, among others, a professor "of Physics, Anatomy, Botany, and Chemistry." Early faculty rosters list one John Chichester a Lecturer in Chemistry in 1793, and Charles Sheppard, Professor of Mathematics and Natural Philosophy. Lewis Reeve Gibbes was Professor of Natural History and Mathematics from 1839 to 1892. Among his many distinctions in the natural sciences was an early development of a periodic system of the elements (1867). E. Emmet Reid, later a distinguished professor at Johns Hopkins University, was Professor of Chemistry from 1898-1901.

The first half of the twentieth century at the College of Charleston was characterized by two professors with exceedingly long tenure as instructors of chemistry. Professor Horatio Hughes (B.S., College of Charleston, 1905; Ph.D., Johns Hopkins University, 1913) served as Professor of Chemistry from 1923 to 1950. Professor Earle DeWitt Jennings (B.S., University of North Carolina, 1922; Ph.D., 1926) was on the faculty from 1926 to 1965. Professor Jennings also served as the Dean of the College from 1949 until 1958. It is for Dr. Jennings that the biochemistry lab is named. The standards of excellence that characterizes today's Department of Chemistry at the College can largely be attributed to two men, Professor Edward E. Towell and Professor Carl J. Likes. Originally hired as an instructor in Physics, Professor Towell (B.S., College of Charleston, 1934; Ph.D., University of North Carolina, 1944) served on the faculty from 1943 until his retirement as Professor of Chemistry in 1976. In addition, Prof. Towell served as Dean of the College from 1958 to 1964 and again from 1968 to 1970. Professor Likes (B.S., College of Charleston, 1937; Ph.D., University of Virginia, 1941) served on the faculties of Tulane University and Hampden-Sydney College before joining the faculty in 1958. Professor Likes retired in 1982. Their leadership in maintaining high academic standards for students of chemistry as the College expanded its enrollment from 400 students to nearly 10,000 helped to ensure that the Department of Chemistry maintained its reputation for excellence during a period of unparalleled growth in the College's history.

Prof. Gerald W. Gibson (B.S., Wofford College, 1958; Ph.D., University of Tennessee, 1964) joined the Department of Chemistry in 1965 and served as chairman from 1967 until he left the department in 1982. Prof. Gibson presided over the growth of the Department of Chemistry from a faculty of four teaching about 150 students in 12 courses to a faculty of 10 full-time professors and two full-time teaching associates. In 1974, the Department of Chemistry moved from its former location in Randolph Hall to the third floor of what is now the Rita Hollings Science Center.

The Gamma Delta Chapter of the Alpha Chi Sigma Chemistry Fraternity was chartered in 1981. The chapter helps provide social and service opportunities to our

students. In 1982 Dr. W. Frank Kinard became chairman when Dr. Gibson was named Associate Provost of the College. An area of specialization leading to a Bachelor of Science in Biochemistry was added to the Department's curriculum in 1984. The program became the third largest in the state and second largest in terms of the number of ACS-certified graduates. Construction started in the spring of 1986 on the new wing of the Science Center. The Department of Chemistry occupied its newly renovated space in August of 1987. Additional space for chemistry lectures and research was included in the upgrading of facilities. At those dedication ceremonies Dr. Marion T. Doig, III was named to the first William Mebane Teaching Chair in Chemistry and Physics.

Dr. Henry Donato served as chairman from 1990-1992 during a time of tremendous growth at the College. It was during this period that the College added the title of University of Charleston and divided into schools with the Department of Chemistry placed in the School of Science and Mathematics. The Department began hosting Woodrow Wilson Institutes for High School Teacher Development during this time with Prof. Elizabeth Martin directing these efforts. From 1991-93 Professor Martin also served as a mentor for the United States Chemistry Olympiad Team. In 1993 the team had its best performance ever, earning two gold and two silver medals.

In May 1995 Professor Martin was honored with the Charles Townes Award for Support of Science and Mathematics Education from the South Carolina Governor's School for Science and Mathematics. Professor Elizabeth Martin was honored on March 29, 1996 with the Governor's Award for Excellence in Science Awareness. The award was presented at the annual meeting of the South Carolina Academy of Science.

The South Carolina Commission on Higher Education reviewed the physical science programs in the state during the spring semester 1996. On February 5, 1998 the department received a commendation for excellence for its chemistry B.A. and B.S. programs as a result of that review. The only other chemistry program so honored was USC-Columbia. In 1997 the B.S. biochemistry program was reviewed as a part of the life sciences C.H.E. review. In 1997 the department added its fourteenth tenure-track faculty member.

On March 20, 1998 the Earle D. Jennings Biochemistry Lab, a gift from his son and daughter-in-law, was dedicated in honor of Dr. Jennings who taught for many years in this department. The Department on November 5, 1998 received a commendation for excellence for its B.S. Biochemistry program from the South Carolina Commission on Higher Education, the only biochemistry program so honored. On March 26, 1999 Professor Elizabeth Martin received one of four 1999 Responsible Care Catalyst Awards from the Chemical Manufacturers Association for Excellence in teaching chemistry at the college/university level.

In 2000 Dr. Charles F. Beam, Jr. received the Chemist of the Year Award from the South Carolina Section of the American Chemical Society—the first person from a strictly undergraduate school to be so honored. He also received the School of Sciences and Mathematics Distinguished Achievement Award. In February of 2000 all six departments of the School of Science and Mathematics were honored by a joint resolution the South Carolina House of Representatives and Senate. That summer they awarded \$4 million to begin architectural and engineering design for a new science facility. In 2002 the firms of Ballenger (Philadelphia) and Liollo (Charleston) were awarded the contract.

Lee Higdon assumed the presidency of the College of Charleston in October 2001. His Fourth Century Initiative included the creation of the Undergraduate Research and Creative Activities Program with Professor Rick Heldrich as its first director. The 2002 Southeast Regional Meeting of the American Chemical Society was hosted by the Department. Over 1500 chemists from around the Southeast attended. The gala reception was held at the South Carolina Aquarium. At the annual meeting of the South Carolina Academy of Science in March 2003, Dr. Charles F. Beam received the Governor's Award for Excellence in Science Awareness in recognition of his thirty years of being a leader in South Carolina in promoting undergraduate research. At its biannual conclave in 2004 the Alpha Chi Sigma Professional Chemistry Fraternity awarded Gary Asleson its Ronald T. Pflaum Award as the outstanding chapter advisor.

In 2005 the College under the leadership of Dr. Pamela Riggs-Gelasco was part of a multi-institution consortium that received a \$17.3 million federal grant to develop innovative technology as part of the National Institutes of Health INBRE (Idea Networks of Biomedical Excellence) program. Charles F. Beam, Professor of Chemistry & Biochemistry was presented the American Chemical Society national award for Outstanding Undergraduate Research at the National American Chemical Society meeting in Atlanta GA in March 2006. The award, sponsored by the Research Corporation, is given annually to a faculty mentor whose research in an undergraduate setting has achieved wide recognition and contributed significantly to chemistry and to the professional development of undergraduate students. He is only the second recipient of the award from South Carolina since its inception in 1986.

In 2008 the College, under the leadership of Dr. Pamela Riggs-Gelasco was awarded a \$1.5 million grant from the Howard Hughes Medical Institute. With this grant support, Dr. Marcello Forconi was hired to expand the biochemistry curriculum in Chemical Biology.

Starting in second week of December 2009 we moved two blocks from third floor of the original section of the Rita Hollings Science Center (corner of George and Coming Streets) to the newly constructed science building (corner of Coming and Calhoun Streets). We held our first labs in the new building in the third week of January of 2010.

FACULTY HONORS

1977

Carl Likes: Distinguished Teaching Award

1984

Marion Doig: Distinguished Research Award

1988

Elizabeth Martin: Distinguished Teaching Award

Elizabeth Martin: Distinguished Service Award

1990

Gary Faber: Distinguished Teaching Award

Charles Beam: Distinguished Research Award

1991

James Deavor: Distinguished Teaching Award

1997

Kristin Krantzman: SSM Outstanding
Achievement Award

1999

Elizabeth Martin: Distinguished Advising Award

2000

Marion T. Doig: Distinguished Advising Award

2000

Charles F. Beam: SSM Outstanding
Achievement Award

2001

Marion T. Doig: Distinguished Service Award

2002

James P. Deavor: Distinguished Advising
Award

James P. Deavor: SSM Outstanding
Achievement Award

2003

F. J. Heldrich: SSM Outstanding Achievement
Award

2004

Pamela Riggs-Gelasco: SSM Outstanding
Achievement Award

2006

Gary L. Asleson: Distinguished Advising Award

2008

Pamela Riggs-Gelasco: SSM Outstanding
Achievement Award

2010

Kristin D. Krantzman: Distinguished Research
Award

2013

Pam Riggs-Gelasco: Outstanding Chemist,
"Chemist of the Year by the SC Section of
the ACS

CHEMISTRY AND BIOCHEMISTRY DEPARTMENT CHAIRS

1967 - 1982

Gerald Gibson

1982 - 1989

W. Frank Kinard

1990

Charles F. Beam, Jr., interim

1990 - 1992

Henry Donato, Jr.

1992 - 1995

Charles F. Beam, Jr.

1995 - 2001

James P. Deavor

2001 - 2002

F.J. Heldrich, interim

2002 - 2008

James P. Deavor

2009 - 2011

F.J. Heldrich, interim

2012 -

Pam Riggs-Gelasco

DEANS, SCHOOL OF SCIENCE AND MATHEMATICS

1991 - 2001

Gordon Jones

2001 - 2002

James P. Deavor, Interim

2002 - 2008

Norine Noonan

2008 - 2009

George Pothering, Interim

2009 - 2010

James P. Deavor, Interim

2011 -

Michael J. Auerbach

MEBANE DISTINGUISHED TEACHING CHAIR

1998

Marion T. Doig, III

1992

Elizabeth M. Martin

1996

Henry Donato, Jr.

2000

W. Frank Kinard

2004

Gary L. Asleson

2008

Pamela Riggs-Gelasco

FACILITIES

The Department of Chemistry and Biochemistry at the College of Charleston occupies part of the first floor and the entire third floor of the Science Building (currently designated NSCB for new science center building) at the corner of Coming and Calhoun Streets. The building was completed in time for us to move into the facility over December of 2009, for use in January of 2010. The street address is 202 Calhoun St. The departmental main office is on the third floor, in room 324.

In NSCB on the first floor we have faculty offices, research laboratories, teaching laboratories and a stockroom. In NSCB on the third floor we have faculty offices, teaching laboratories, research laboratories, departmental offices, a conference room, student computer rooms for use by majors, and instrumentation support rooms. Chemistry classrooms are located in the Lightsey Center (Rooms 344 & 346), Rita Hollings Science Center (Room 317), and Maybank Hall (Room 322).

Our teaching laboratories have hoods for students to perform experiments, sitting areas for lectures and quizzing, common work benches, and internet access. Our research laboratories have student study areas, hoods and bench spaces. Room numbers and floor maps are shown on the next two pages.

Instructional Laboratory Rooms

General: 125
Introductory: 115, 141, 145
Honors: 125
Intro Organic: 105 & 109
Quantitative Analysis: 323
Biochemistry: 311
Physical: 329
Synthesis: 333 & 334
Instrumental: 321

Instrumentation / Support Rooms

Stockroom: 161
1st Floor Lab Prep: 107, 113, 125B, 143
3rd Floor Lab Prep: 311A, 323A
Radiochemistry: 336
Biochemistry Equipment: 305
NMR: 319
Tissue Culture: 311E
Chromatography: 311D
Cold Room: 311C
Autoclave: 311B
Lasers: 331
Alpha Chi Sigma:
Computer / Classroom: 325
Computer / Study: 327
Mass Spectroscopy: 338

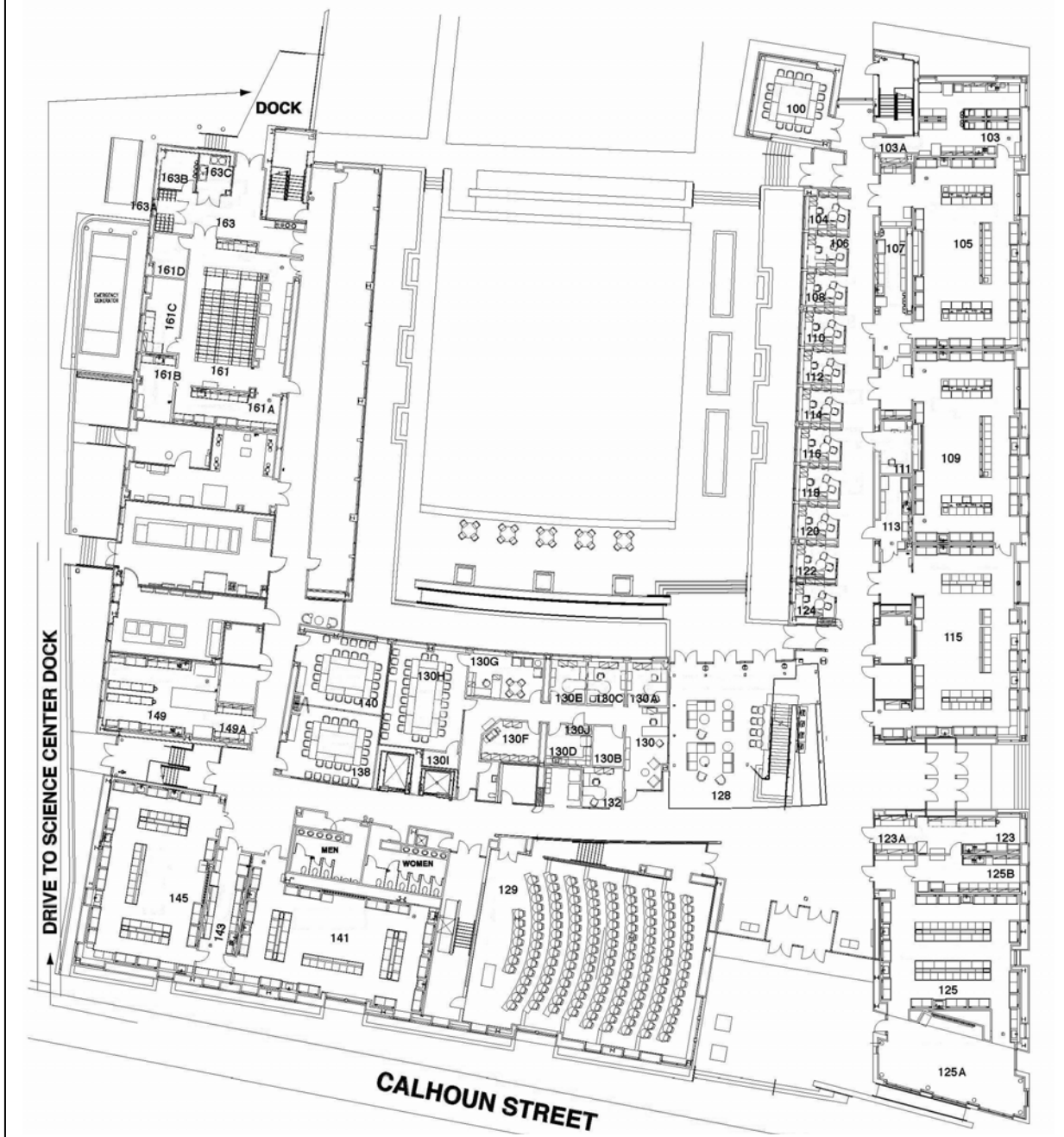
Student Use Rooms

Alpha Chi Sigma: 111
Computer / Classroom: 327
Computer / Study: 325

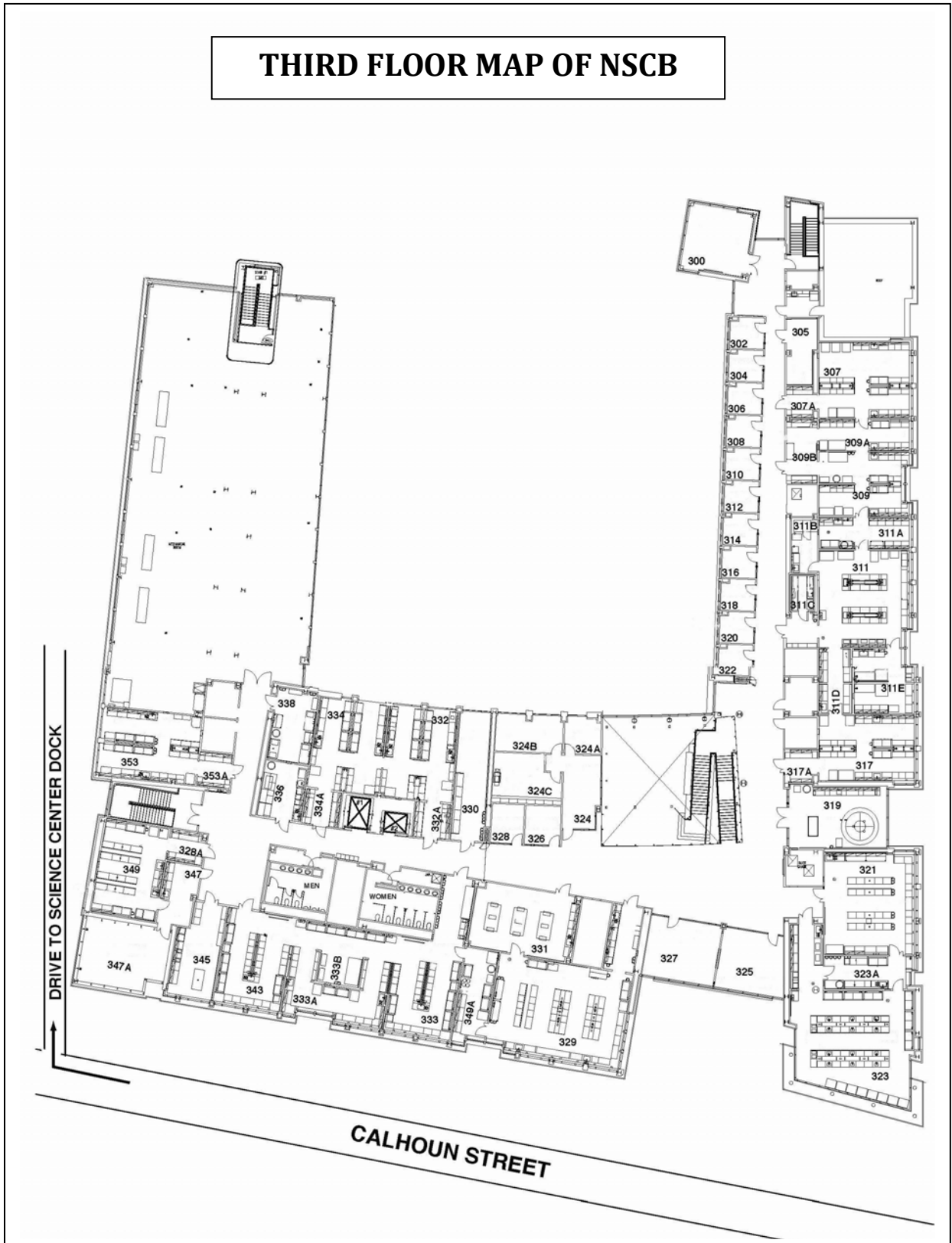
Research/Office Rooms

Beam (organic): R 123 O 124
Barker (organic): R 332, O 312
Boucher (physical): R 329A, O 322
Cory (analytical): R 349, O 314
Deavor (analytical): O 130D
Doig (bioanalytical): O 306
Forconi (chemical biology): R 307, O 302
Fox (biochemical): R 309, O 304
Guirgis (physical): R 353, O 316
Heldrich (organic): R 343, O 320
Krantzman (theoretical/physical): R 118, O 116
Lavrich (physical): R 149, O 120
Overby (inorganic): R 353, O 318
Riggs-Gelasco (biochemical): R 317, O 324
Rogers (biochemical): R 309A, O 308
Tonks (inorganic/polymer): R 343, O 106
Van Horn (organic/polymer): R 103, O 104
Wyatt (organic/medicinal): R 334, O 310

FIRST FLOOR MAP OF NSCB



THIRD FLOOR MAP OF NSCB



WHY STUDY CHEMISTRY OR BIOCHEMISTRY?

Chemistry is fundamental. To understand why an autumn leaf turns red, or why a diamond is hard, or why soap gets us clean, requires an understanding of chemistry. To design a synthetic fiber, a life-saving drug, or a space capsule requires knowledge of chemistry. The behavior of atoms, molecules, and ions determines the sort of world we have to live in, our shapes and sizes, and even how we feel on a given day. So chemistry is worth studying, first of all, just because it is such a good antidote for ignorance.

Chemistry and Biochemistry are worthwhile disciplines because they prepare us for the real world. A college graduate with a degree in chemistry or biochemistry is in a good position to choose a useful and interesting career. Food chemistry, polymer chemistry, dyestuff chemistry, chemical oceanography, chemical information, chemical sales-the list of career possibilities is long and varied. Even in times when unemployment rates are generally high, the chemist remains the scientist most in demand.

Chemists and biochemists are very much involved in tackling the problems faced by our modern society. On a given day, a chemist may be studying the mechanism of the recombination of DNA, measuring the amount of insecticide in drinking water, comparing the protein content of meats, developing a new antibiotic, or analyzing a moon rock. Participation in important and interesting projects as a competent chemical scientist begins, of course, with a study of introductory chemistry as an undergraduate.

Chemistry and biochemistry are challenging majors. The undergraduate curriculum is demanding both intellectually and in terms of time. There are no "easy courses" to be found in it. One studies inorganic chemistry, organic chemistry, biochemistry, physical chemistry and analytical chemistry, examining the most basic qualities of matter, mastering strategies of chemical synthesis, solving chemical mysteries in the laboratory, and learning to communicate facts and theories about chemistry to others. Elective courses may include environmental chemistry, or one may choose to delve more deeply into one of the other sub-disciplines of chemistry. Research with a member of the chemistry faculty in the junior or senior year can provide valuable experience at the frontiers of the science.

Whether your goal is to become a surgeon or a research scientist, a teacher or an information specialist, you should examine chemistry or biochemistry as a major. It isn't for everyone; but those students who do choose chemistry usually find it as interesting as it is challenging, and they always take great pride in the degree they earn as undergraduates.

WHAT COMES AFTER THE BA/BS

Many, but not all, chemistry or biochemistry majors will seek admissions to other schools to earn advanced degrees or training before starting out on a career. It is important to remember that earning a liberal arts degree, like a BA or BS in Chemistry/Biochemistry, is not a career in and of itself. Rather, earning a BA or BS is a preparatory step so that you can start a career. Your professional career begins after you are out of school.

So how does your undergraduate program help you to get started on your career? Whether you will be looking for a job right out of college or looking to get admitted to graduate/professional school, your grades in college will matter. The higher the GPA in your major and overall, the more competitive you will be. If you are headed off to graduate or professional school, then in addition to GPA you will most likely be evaluated based on your performance on a standardized test: (MCAT for Med School, DAT for dental school, LSAT for law school, GRE for graduate school, PCAT for Pharmacy school, *etc.*) In most cases the GPA and test score are threshold numbers. In order to get where you want to go, you need to have GPA and standardized tests scores that are above a threshold level set by your employer or the school you want to get into. The more competitive the job or school, the better you need to do in terms of GPA or test scores in order to get considered. But the objective is not to get considered, it is to get accepted. Getting accepted requires you to get picked out of all of the other candidates who are also being considered because their GPA or test scores exceed the threshold. These are the individuals you are competing against for the job or acceptance into a program.

What does it take to get selected from the pool of candidates being considered by an employer or school you want to get into after college? That will vary according to the needs to the company or school, but there are things you can do while you are an undergraduate that will enhance the chances that you are the person selected. Most folks are looking for the qualitative characteristics that indicate you can do the job and be an effective member of the group you will be joining. What are those qualitative metrics? Things like doing research, making research presentations or having your research published, volunteering, belonging to social or professional organizations, doing extra academic work outside the structured classroom, leadership on campus or off campus, summer employment, awards, scholarships or honors earned. Some of these activities are symbiotic. Joining a professional organization and becoming an active member of that group can easily result in your getting elected to a leadership role or doing volunteer work, or both. Doing research can lead to presentations, publications and leadership opportunities within your research group or for the department. In fact, doing research has become so important for students who are trying to get into professional or graduate school, that it has become a requirement for the more competitive schools and is an expectation for almost all graduate schools in chemistry or biochemistry.

RESEARCH FOR CHEMISTRY & BIOCHEMISTRY STUDENTS

All chemistry majors are encouraged to pursue independent research as early as possible. If you stay involved in a research project for an extended period of time, you will increase your opportunity to make a significant contribution and to give an oral or poster presentation of your results at a scientific meeting and possibly even to be listed as a co-author on a research publication. Student presentations are typically made at Southeastern Regional American Chemical Society Meeting (fall) and the Annual Meeting of the South Carolina Academy of Science (spring). Occasionally students make research presentations at National Meetings of the American Chemical Society (generally held in August and March) or other specialized meetings. All students who participate in research get a chance to present their results at the College of Charleston School of Science and Mathematics Research Poster Session in April.

One advantage of joining a faculty mentored research group in the Department of Chemistry & Biochemistry at the College of Charleston is that as a group member you will have a home in our department. Each research group has its own research lab, and each research lab has a study area associated with it. Students in the research group can use those study areas before, in-between and after classes.

The undergraduate research experience provides excellent training for graduate studies and also prepares the pre-medical student for the type of independent thinking and hypothesis testing that will characterize the clinical diagnosis portion of their education. Students who are actively engaged in a faculty mentored research program generally work on a problem of interest to the mentor using a strategy developed in collaboration with the faculty mentor. Usually a student will tackle one piece of a puzzle which is part of a larger problem. A faculty mentor might have a long term goal of designing a new molecule which is expected to have a special biological activity or a particular physical property important for use in a specific application. An individual student might be involved in testing a hypothesis about how a particular compound might be made or purified or how the properties of a class of compounds might be related to the desired final target. Or perhaps a student might be trying to come up with new analytical methods to evaluate a compound or an activity or a property. As an undergraduate you do not need to come up with the original research idea on your own in order to get involved in research, or to make a significant scientific breakthrough. You do need to have courage, drive, determination and persistence.

In addition to doing the research, if you get involved in research at the College of Charleston you will have the opportunity to write a grant proposal to apply for funding from the Undergraduate Research and Creative Activities (<http://www.cofc.edu/ur>) program to support your work. If you write one of these applications and it is funded, you and your mentor will have more money to pursue the work, and you can put the fact that you succeeded in getting a competitive research award on your resume, CV or job application. Grants are awarded to support the costs of materials or supplies for academic year projects (AYRA); they are awarded to offset the costs of travel to make research presentations at meetings (RPG); they are awarded in special circumstances for very expensive academic year research projects (MAYS); and, they are awarded for summer research efforts (SURF).

The SURF awards are especially nice since they include a small stipend (up to \$3,500) and supply money for conducting research in a ten week period over the summer. There are other paid summer research assistant positions available in the Department of Chemistry and Biochemistry for students who are working with faculty mentors with external research grant support. But even if you do not get paid for doing research in the summer you should consider making an effort to get involved.

Students who perform research can earn up to 10 GPA credit hours by taking both of the two-credit research courses CHEM 481, CHEM 482, and the 6 credit year-long Bachelor's Essay course CHEM 499 (or HONS 499). For each of these credited courses you must have a different research product (presentation or paper). As a general rule of thumb, for every 3 hours a week of laboratory effort in an academic year semester, you can earn one academic credit hour. The Bachelor's Essay is required of all Honors College graduates, and it is recommended for all chemistry/biochemistry majors who know they want to go to graduate school in a scientific discipline. It is also recommended for pre-professional students who think they might want to do research as part of their career. In addition to these 10 credit hours for research, students are encouraged to have their research experiences recorded on their academic transcript by signing up for the non-GPA course CHEM 397. The appearance of these research courses (CHEM 397, CHEM 481, CHEM 482, CHEM 499) on your transcript indicates to whoever is looking at your transcript that you have done more than the minimum as an undergraduate. To register for any of these research courses, you will need the permission of the faculty member who will be the mentor for the work you do. Registration is accomplished by submitting the appropriate form (Application for Enrollment in Bachelor's Essay, or Application for Individual Enrollment) accessible to your mentor from the faculty tab in MyCharleston. Check with your mentor about the proper sequencing for registering in these courses. Some mentors might prefer you get a non-credit experience (CHEM 397) first, other might encourage you start out with credit research experience (CHEM 481).

Students can also do research in an academic research lab off campus or in a different academic department on campus and get academic credit in CHEM for that experience. In this case, the student still needs to identify a Department of Chemistry & Biochemistry College of Charleston faculty member who is willing to be the departmental "mentor" who helps you to submit the previously mentioned registration form and oversee the awarding of the final grade for the experience. This has been particularly useful for students who conduct research in laboratories at the Medical University of South Carolina. (For credit associated with industrial or non-academic lab experiences, see the section below on Co-Operative Education Programs and Internships for Chemistry & Biochemistry).

CO-OPERATIVE PROGRAMS AND INTERNSHIPS

Students are eligible to receive up to 4 hours credit by enrolling in CHEM 381, Internship. A Co-op program is where Department of Chemistry students are employed as employees for the purpose of gaining job experience and skills training in the chemistry field with various industries. Students will be scheduled to rotate between semesters of student enrollment at the College of Charleston and full-time employment. Students must have completed their freshman year and maintain a minimum 2.5 grade point average within their major to be eligible to participate in this program. Other prerequisites may apply depending on the industry involved. Students may be required to successfully pass a pre-employment physical which includes a drug screening test. Additionally, in subsequent returns to the work environment after a semester in school, the student may be required to pass another drug screening before they can return as a Co-op employee. One exception, individuals may be allowed time off from the normal work schedule to attend classes which, because of sequencing problems, are not scheduled during the semester when the student is not in full time attendance at the college.

Compensation varies depending on the place of employment. The Co-op student will report to a Coordinator or Supervisor who will be responsible for the training, supervision, and evaluation of job performance. At the end of each Co-op work period, the Supervisor will prepare an evaluation form and review it with the student. The review will address progress made, areas of improvement, and future involvement, if applicable. A copy of the evaluation form will be provided to the student and another copy forwarded to the Career Services Department at the College of Charleston.

Internships are also available on a part-time or full-time basis. These must be carried out in a non-academic lab. (For credit associated with academic lab experiences, see the preceding section in this handbook on Research for Chemistry and Biochemistry Students). A faculty advisor is appointed to award the grade to be received. Arrangements for the internship must be made prior to the semester in which the work is to be carried out. Students must have a junior or senior standing and maintain a minimum 2.5 GPA both overall and in the major. Students benefit from experiential learning by receiving a better understanding of the applications of chemistry and better preparing themselves for employment opportunities upon graduation. Students are required to submit a written report to the faculty advisor and secure a letter addressing the quality of the student's work from the field supervisor. Separate reports will be required for each semester in which credit is awarded. A maximum of 4 credit hours may be earned in CHEM 381. Credit is awarded on the basis of one credit hour per 45 hours of lab work completed.

Co-ops and internships are coordinated through the Office of Career Services.

<http://www.cofc.edu/~chem/coop/coop.html>

GOALS FOR THE CHEMISTRY CURRICULUM

In addition to the general education goals of the College of Charleston, the student graduating in Chemistry or Biochemistry should be able to:

1. make theoretical predictions based on fundamental chemical principles
2. rationalize from chemical principles the results of experimental data
3. select appropriate methods of synthesis of compounds
4. select appropriate methods of analysis of compounds
5. identify compounds and elements
6. use common tools of chemistry (instruments, glassware, etc.)
7. use modern technology (instrumentation such as NMR, FTIR, GC-MS, UV-VIS, etc.)
8. use the scientific method properly and appropriately
9. appreciate the role of chemistry in our society
10. use computers to acquire, process and communicate data
11. apply mathematical principles in the solution of chemical problems
12. communicate results of scientific investigation orally and in writing
13. use the chemical literature appropriately
14. recount and explain the major laws, facts, and theories of chemistry to someone uninitiated in the subject
15. be an effective and valued member of a team
16. be aware of and abide by the ethical standards and expectations of professional chemists
17. possess the desire and ability to continue to learn and explore.

In addition, biochemistry majors should:

1. know the structures, chemical and solution properties, and functions of the four major classes of biomolecules (carbohydrates, lipids, proteins, and nucleic acids)
2. be familiar with the methods for isolating and characterizing biomolecules
3. understand the mechanisms and catalysis by enzymes and the roles of the common cofactors have an appreciation of the theoretical basis of enzyme kinetics and a facility with eth use of kinetic data
4. be able to apply thermodynamic principles to biochemical systems
5. have and in-depth knowledge of the major metabolic pathways and their regulations
6. be aware of the structure and properties of biological membranes and the function of specific organelles
7. be cognizant of the means of storage, retrieval, and utilization of genetic information.

It is a goal of our program to help you continually strengthen your capacity for learning and your knowledge of chemistry and biochemistry. We hope that our curriculum presents increasing intellectual challenges each semester and that we help you to steadily improve to best of your ability as you progress through our curriculum.

THE IMPORTANCE OF ACADEMIC ADVISING

The Department of Chemistry & Biochemistry is committed to supporting you throughout your academic career at the College of Charleston as you develop and achieve your educational goals in order to prepare you for your career after graduation. This is done via academic advising where one of our faculty members partners with you to serve not only as a resource in selecting courses but also to serve as a mentor as you make post-graduation plans. While you may change your mind several times as to what you want to do after you graduate, you need to start planning and continually monitor your progress in order to keep your options open. It is a collaborative effort between the student and the academic advisor.

Your advising meetings are an important part of the process which begins with your first appointment and continues until you graduate. Our faculty members will help you develop your academic plan and plan for post-graduate study or to enter the workforce directly upon graduation. You and your advisor will be discussing many things ranging from your previous experiences to your future aspirations. These different areas of discussion may include but are not limited to the following:

- Your strengths
- Your areas which need further growth
- Your future, especially your career interests
- Your background such as prior course work in high school or at the college level
- Your priorities and obligations such as outside employment and family responsibilities
- College and departmental policies and procedures
- Opportunities that will complement your educational goals such as special seminars or courses

Each semester you should meet with your academic advisor to discuss your course selection for the following semester as well as your progress towards your degree and your career plans. This meeting usually happens in early October for spring semester and early March for fall semester. It is your responsibility to schedule the meeting by contacting your advisor. There are a few things that you should do prior to your appointment in order to make your course selection and registration process more productive.

Before your appointment:

- Review the core curriculum (General Education) requirements as well as the course requirements within the chemistry/biochemistry major in the College of Charleston Undergraduate Catalog or the Chemistry /Biochemistry Majors Handbook
- Review the course schedule of courses for the next semester. This is available on-line via MyCharleston.
- Develop a list of possible classes
- Check to see if you meet course prerequisites

During your appointment you can expect to:

- Confirm your remaining requirements.
- Design a schedule that fits your needs.

After your appointment, use DegreeWorks to monitor your progress and plan future choices.

TRACKING YOUR PROGRESS AS A MAJOR

Note that there is a degree "*check-list*" for chemistry and biochemistry majors in this handbook. You can use the plan tool in DegreeWorks, the printed tools provided in this handbook, or other devices as necessary. The student should keep an independent record of his or her progress toward a degree so that proper course scheduling can be done. Your advisor in the Department of Chemistry and Biochemistry will have a record and a comparison should be made during advising and pre-registration periods.

Some Thoughts on Planning Your Academic Schedule

1. Pay attention to the pre-requisite and co-requisite structure for courses. This information tells the student the level at which the course is taught and the skills that the student is expected to have mastered before attempting the course. Also look at the proposed course schedules on the next few pages to see what courses should be taken in sequence. In general, 100 level courses are freshman level, 200 level courses are second or third year level, 300 level courses are third year level, and 400 and 500 level courses are senior or beginning graduate level courses.
2. Plan your schedule a year in advance. Note when courses you plan to take are offered. While departments try to ensure that interdepartmental conflicts are minimized, some courses are bound to have conflicting schedules.
3. Plan to have taken all of the "core" courses in your major or pre-professional program before taking the GRE exams for graduate school or the MCAT exam for medical school. Obviously, the student who has completed more fundamental course work before taking these examinations will have an advantage in any subject area examination. The Study Skills Lab (953-5635) can assist students interested in properly preparing for standardized examinations (e.g., GRE, MCAT). Don't wait until the last minute to start preparing for these examinations. Some of our best students need to become "test wise", because they have experienced earlier difficulties with standardized examinations.
4. Ultimately, the student is responsible for seeing that all degree requirements are met and courses are correctly scheduled. If you have any doubts, ask your advisor or the department chairman. Act before any deadlines arise and your choices become limited.

DECLARATION OF MAJOR

As a science student it is important that you declare a major early so that you are assigned an academic advisor in the department of your major. Science majors, especially chemistry and biochemistry majors, need to take courses in a well-defined order in order to graduate on time. As an example consider just one course that is required for all chemistry or biochemistry majors, CHEM 341. CHEM 341 is Physical Chemistry, and it is currently only offered in the fall semester, so you must take during or before the fall semester of your last full academic year of study. Physical Chemistry is the study of chemical phenomena using the methods of classical and quantum physics and the mathematical tools of calculus. In order to do well in physical chemistry, it then stands to reason that you should have completed your calculus and physics first. And the physics needs to be calculus based physics. So you need to take MATH courses first, PHYS second, then CHEM 341. The sequencing of courses in your major and essential cognate courses (like MATH or PHYS or BIOL) outside your major is complex and the guidance offered by a knowledgeable advisor can make it a lot easier to navigate through the curriculum.

Students declare majors online using the POSM (Program of Study Management) feature in MyCharleston. You may change your mind and switch or drop or add majors or minors as you want. But it is important to declare a major so you can get the disciplinary academic advice you need, when you need it.

CHEMISTRY & BIOCHEMISTRY MAJORS EMAIL LIST

The College of Charleston Administrative Computing & Telecommunications Services Department maintains PMDF Mailing Lists for chemistry & biochemistry majors. This is updated nightly from MyCharleston system. Besides being assigned a faculty member from our department to be your advisor, another reason for declaring a chemistry or biochemistry major is so that you can automatically be added to these email lists and receive important announcements regarding registration, graduation requirements, seminars, scholarships, Special Topics course offerings, and departmental news.

Each student at the College of Charleston is given a Cmail account. Faculty and staff will expect you to pay attention to any messages delivered to that account. Your Gmail account has a storage limit of 7 GB and a lot of Google applications. Consult the Information Technology website (<http://it.cofc.edu/accounts-email/cmail/index.php>) for help or questions about your Gmail account.

STUDENT ORGANIZATIONS

Many of our students and faculty members become members of the professional chemistry fraternity, Alpha Chi Sigma (AXE). Students are encouraged to join a professional organization, like AXE, the pre-medical society Alpha Epsilon Delta (AED), and the South Carolina Alliance for Minority Participation (SCAMP) in order to get to provide service to the community, to get to know their peers better and to get additional advice and support.

PLANNING YOUR PROGRAM IN CHEMISTRY OR BIOCHEMISTRY

Students who plan to major in chemistry or biochemistry should make an early decision as to what their ultimate career goal will be. A professional career in the field of chemistry requires graduate studies in chemistry while the medical professions require extensive training after the undergraduate degree. There are essentially three tracks to be taken in seeking a degree in chemistry or biochemistry at the College of Charleston. These tracks can be characterized as the professional chemist's degree (B.S. in Chemistry or B.S. in Biochemistry) and the liberal arts degree (B.A. in Chemistry). Some students majoring in another science area may also elect to complete a minor in chemistry.

For entering students, the distinctions between these degrees may not be appreciated, but it is extremely important that the student enroll in the Principles of Chemistry course *as early as possible, preferably in their freshman year*. There are several reasons for this approach. First, chemistry is at the core of all sciences and some understanding of chemistry is needed to fully appreciate the fundamental concepts of other sciences. In addition, the chemistry curriculum is highly structured and courses must be taken in a specified sequence.

Finally, for pre-medical students, it is quite important that a majority of the fundamental science courses be taken before taking the Medical College Admission Test (MCAT) in April of the junior year. The MCAT will be including biochemistry topics starting in 2014, and because Biochemistry has two years of pre-requisites, it is wise to start your chemistry course work as soon as possible. The recommended timeline for course work related to premedical and other health profession careers is posted on the pre-health professions website.

(<http://spinner.cofc.edu/~healthprof/medicine/index.html>)



ADVISING TOOLS

The College of Charleston provides two great advising tools that are available to all students. The first is a form that you can fill out by hand to track your progress. These forms are updated periodically and the most recent form can be downloaded from the advising center website (<http://advising.cofc.edu/degree-worksheets/index.php>). To access the appropriate form, simply click the header corresponding to the catalog year for your degree requirements. Under the header "Degree Worksheets" on the left hand column, if you were to click Degree Worksheets 2010, then scroll down to the School of Science and Mathematics, and finally select BS, Biochemistry. The forms that you will access are similar to those shown on the following pages of this handbook.

In addition to these advising sheets, you are strongly encouraged to use the DegreeWorks feature within [MyCharleston](#). Within DegreeWorks you can map out alternative pathways to graduate with different majors, check progress towards degree completion, and monitor progress towards graduation.

OFFICE OF THE REGISTRAR

One Stop Answers for Common Student Requests

About the Office

Academic Catalogs

Calendars / Important Dates

Catalog Year Policy

Course Offerings

Course Registration

Degree and Enrollment Verification

Degree Works: Your Degree Audit Tool

Faculty Honors

FERPA

Forms

General Education Requirements

Grades

Graduation Information (Undergraduate)

Lawful Presence

POSM: Declaring Your Major

Program of Study Worksheets

Worksheets 2013-2014

Worksheets 2012-2013

Transcripts

COLLEGE HOME / OFFICE OF THE REGISTRAR / PROGRAM OF STUDY WORKSHEETS

Program of Study Worksheets
Course Requirements by Catalog Year & Major



The Registrar's Office maintains this resource of undergraduate program of study worksheets detailing course requirements by **catalog year** and major to assist you in planning your academic career. These worksheets are helpful student tools designed to enhance the student advising experience but should be used in consultation with other advising and campus resources. Please refer to the **undergraduate catalog** for full program and course descriptions. Students should also refer to their degree audit in **Degree Works**. Degree Works provides students with access to their unofficial degree audit which lists information regarding their current program(s) of study including **institutional requirements**, **general education requirements**, major requirements (with concentration, cognate or track, if applicable) and minor requirements.

Degree requirements, like education, are ever-evolving; therefore, the contents of these worksheets are subject to change without notice. To be absolutely certain you have met the requirements of your major for graduation, you must consult with the department to confirm and approve your successful completion of the required classes. Additional information about graduation can be found on the **Graduation Information** web page.

These worksheets are in PDF format. You will need Adobe Reader to view these files:



PROGRAM OF STUDY WORKSHEETS

- 2013-2014 Catalog Year
- 2012-2013 Catalog Year

CHEMISTRY DEGREES – QUICK VIEW

BS CHEMISTRY plus liberal arts requirements plus electives, totaling 121 hours

Freshman	Sophomore	Junior	Senior
CHEM 111/112 + labs	CHEM 231/232 + labs	CHEM 341/342 + labs	CHEM 490/492
MATH*	CHEM 221/221L	CHEM 351	CHEM 511/512L
	MATH *	CHEM 371/371L	CHEM 521/521L
	PHYS 111/112 + labs		Chemistry Electives
	Research	Research	Research

BS BIOCHEMISTRY plus liberal arts requirements plus electives, totaling 121 hours

Freshman	Sophomore	Junior	Senior
BIOL 111/112 + labs	CHEM 231/232 + labs	CHEM 341/342 + labs	CHEM 490/492
CHEM 111/112 + labs	CHEM 221/221L	CHEM 351/352/354L	
MATH*	MATH *	BIOL 312/312L	
	PHYS 111/112 + labs		CHEM/BIOL Electives
	Research	Research	Research

BA CHEMISTRY requires less chemistry hours and is pursued by students who wish to rapidly complete a degree (transfer students or those who declare chemistry late in their college career, those who pursue a secondary teaching certificate, or those wishing double major or minor in other disciplines.

BA CHEMISTRY plus liberal arts requirements plus electives, totaling 121 hours

Freshman	Sophomore	Junior	Senior
CHEM 111/112 + labs	CHEM 231/232 + labs	CHEM 341/342 + labs	CHEM 490/492
MATH*	CHEM 221/221L	Research	Chemistry Electives
	MATH *		Research
	PHYS 111/112 + labs		
	Research		

Name:
 CWID:
 Date:

COLLEGE OF CHARLESTON
Academic Requirements
School of Science and Mathematics
B.S. in Biochemistry
Undergraduate Catalog 2010-2011

-----**GENERAL EDUCATION REQUIREMENTS**-----
 A MINIMUM OF 122 CREDIT HOURS IS REQUIRED FOR GRADUATION

English Composition: ENGL 110 _____

- ENGL 110 is required unless credit is awarded for AP or Transfer ENGL credit.
- Students with credit for ENGL 101 & 102 (6 hrs) satisfy the General Education requirement for ENGL.
- Students with ENGL 101 credit (3 hrs) must complete ENGL 110 (4 hrs) or 215 (3 hrs). ENGL 215 is recommended.
- Students with ENGL 102 credit (3 hrs) must complete ENGL 110 (4 hrs) or 215 (3 hrs). ENGL 110 is recommended.

History Requirement (6 hrs):

	<u>Pre-Modern History</u>	<u>Modern History</u>
	HIST 101 or	HIST 102 or
	HIST 103 or	HIST 104 or
	JWST 210 or	JWST 215
	CLAS 105	

- One course in pre-modern history and one course in modern history. The two courses do not have to be taken in sequence.

Natural Science Sequence (8 hrs):

	<u>Lecture: CHEM 111</u>	<u>Lecture: CHEM112</u>
	<u>Lab : CHEM111L</u>	<u>Lab: CHEM 112L</u>

Math/Logic Requirement (6 hrs): MATH 120 _____ MATH 220 _____

Foreign Language Requirement (0-12 semester hrs: satisfactory completion of 202 or its equivalent):

- Choose one language from the following: ARBC, CHNS, FREN, GREK, GRMN, HBRW, HNDI, ITAL, JPNS, LATN, PORT, RUSS, or SPAN.
- Native speakers of languages other than English may be exempt from further language study, contact the School of Languages, Cultures and World Affairs.

Humanities Requirement (12 hrs):

- For a complete listing please refer to the Humanities list at advising.cofc.edu/pdf/humanities.pdf
- Maximum of 6 hours from any one area except interdisciplinary HONS
- History 101, 102, 103, 104 and JWST 210, 215 when not used to fulfill general education history requirement

Social Sciences Requirement (6 hrs): _____

- Choose from ANTH 100-499; COMM (selected courses); ECON 100-499; LACS 100-499; LING 125; POLS 100-499; PSYC 100-499; SOCY 100-499; URST 201, 310. For a complete listing please refer to the Social Science list at advising.cofc.edu/pdf/social_sciences.pdf

General Electives (required hrs vary):

Notes:

This advising worksheet page for general education requirements is the same for all majors in Chemistry Biochemistry. The different requirements and advising worksheet pages for the BS Biochemistry, BS Chemistry and BA Chemistry are shown on the following three pages.

----- REQUIREMENTS FOR B.S. IN BIOCHEMISTRY (72 hours) -----

You must achieve a minimum cumulative GPA of 2.00 in major area courses: (CHEM 100-599; BIOL 111, 112, 310, 311, 312, 321).

CHEMISTRY Requirement (40 hrs):		Credits	Prerequisite Notes
CHEM 111	Principles of Chemistry	(3)	
CHEM 111L	Principles of Chemistry Lab	(1)	
CHEM 112	Principles of Chemistry	(3)	
CHEM 112L	Principles of Chemistry Lab	(1)	
CHEM 221	Quantitative Analysis	(3)	
CHEM 221L	Lab	(1)	
CHEM 231	Organic Chemistry	(3)	
CHEM 231L	Lab Techniques	(1)	
CHEM 232	Organic Chemistry	(3)	
CHEM 232L	Organic Synthesis and Analysis	(1)	
CHEM 341	Physical Chemistry	(3)	
CHEM 341L	Physical Chemistry Lab	(1)	
CHEM 342	Physical Chemistry	(3)	
CHEM 342L	Physical Chemistry Lab	(1)	
CHEM 351	Biochemistry	(3)	
CHEM 352	Biochemistry II	(3)	
CHEM 354L	Biochemistry Lab	(1)	
CHEM 490	Chemistry and Biochemistry Seminar	(3)	
CHEM 492	Senior Seminar	(3)	
CHEM 511	Advanced Inorganic Chemistry	(3)	
BIOLOGY Requirement (16 hrs):			
BIOL 111	Introduction to Cell and Molecular Biology	(3)	
BIOL 111L	Lab	(1)	
BIOL 112	Evolution, Form, and Functions of Organisms	(3)	
BIOL 112L	Lab	(1)	
BIOL 312	Molecular Biology	(3)	
BIOL 312L	Lab	(1)	
Four hours in advanced laboratory courses selected from:			
BIOL 305/305L Genetics	BIOL 310/310L General Microbiology	BIOL 313/313L Cell Biology	BIOL 321/321L General and Comparative Physiology
BIOL	Biology Elective		(3)
BIOL	Biology Elective Lab		(1)
PHYSICS Requirement (8 hrs):			
PHYS 111	General Physics		
PHYS 111L	Physics Lab	(1)	
PHYS 112	General Physics II		
PHYS 112L	Physics Lab	(1)	
MATHEMATICS Requirement (8 hrs): Math 221 is strongly recommended			
MATH 120	Introductory Calculus	(4)	
MATH 220	Calculus II	(4)	

• The Department of Chemistry recommends CHEM 481 and CHEM 482

Notes:

Last Updated May 2010
Subject to change without notice.



REQUIREMENTS FOR B.S. IN CHEMISTRY (56 hours)

You must achieve a minimum cumulative GPA of 2.00 in major area courses: (CHEM 100-540).

INTRODUCTORY COURSES (15-16 hrs):		Credits	Prerequisite Notes
CHEM 111	Principles of Chemistry	(3)	
CHEM 111L	Principles of Chemistry Lab	(1)	
CHEM 112	Principles of Chemistry	(3)	
CHEM 112L	Principles of Chemistry Lab	(1)	
CHEM 221	Quantitative Analysis	(3)	
CHEM 221L	Quantitative Analysis Lab	(1)	
CHEM 231	Organic Chemistry	(3)	
CHEM 231L	Lab Techniques	(1)	
CHEM 232	Organic Chemistry	(3)	
CHEM 232L	Organic Synthesis and Analysis	(1)	
CHEM 341	Physical Chemistry	(3)	
CHEM 341L	Physical Chemistry Lab	(1)	
CHEM 342	Physical Chemistry	(3)	
CHEM 342L	Physical Chemistry Lab	(1)	
CHEM 351	Biochemistry	(3)	
CHEM 371	Chemical Synthesis and Characterization	(3)	
CHEM 490	Chemistry and Biochemistry Seminar	(3)	
CHEM 492	Senior Seminar	(3)	
CHEM 511	Advanced Inorganic Chemistry	(3)	
CHEM 512L	Advanced Inorganic Chemistry Lab	(1)	
CHEM 521	Instrumental Analysis	(3)	
CHEM 521L	Instrumental Analysis Lab	(1)	
PHYSICS Requirement (8 hrs):			
PHYS 111	General Physics		
PHYS 111L	Physics Lab	(1)	
PHYS 112	General Physics II		
PHYS 112L	Physics Lab	(1)	
MATHEMATICS Requirement (4 hrs):			
MATH 220	Calculus II	(4)	

• The Department of Chemistry recommends CHEM 481 and CHEM 482

Notes:

Last Updated May 2010
Subject to change without notice.



Note that MATH 120 is a pre-requisite of MATH 220. The Department recommends MATH 221 for the BS Chemistry major, just as it does for the BS Biochemistry major. Discrepancies like this are just one more reason it is important that you consult with your advisor instead of relying entirely on other advising tools.

----- REQUIREMENTS FOR B.A. IN CHEMISTRY (34 hours) -----

You must achieve a minimum cumulative GPA of 2.00 in major area courses: (CHEM 100-540).

CORE COURSES (31 hrs):		Credits	Prerequisites
CHEM 111	Principles of Chemistry	(3)	
CHEM 111L	Principles of Chemistry Lab	(1)	
CHEM 112	Principles of Chemistry	(3)	
CHEM 112L	Principles of Chemistry Lab	(1)	
CHEM 221	Quantitative Analysis	(3)	
CHEM 221L	Quantitative Analysis Lab	(1)	
CHEM 231	Organic Chemistry	(3)	
CHEM 231L	Lab Techniques	(1)	
CHEM 232	Organic Chemistry	(3)	
CHEM 232L	Organic Synthesis and Analysis	(1)	
CHEM 341	Physical Chemistry	(3)	
CHEM 341L	Physical Chemistry Lab	(1)	
CHEM 342	Physical Chemistry	(3)	
CHEM 342L	Physical Chemistry Lab	(1)	
CHEM 492	Senior Seminar	(3)	
Elective Requirement (3 hrs): choose any CHEM at or above the 300 level excluding CHEM 583			
CHEM	Elective	(3)	

Notes:

Last Updated May 2010
Subject to change without notice.



SUGGESTED COURSES AND PROGRAMS

The idealized schedules on the following pages are heavily loaded in the first three years. Students often take one sequence of courses in the summer to lessen their academic year course loads. Students planning on pursuing graduate studies are encouraged to take advanced chemistry courses in their senior year in addition to the research courses. Pre-medical students are advised to have completed or be enrolled in 19 hours of chemistry (through Biochemistry, CHEM 351), 16 hours of biology (including 3 hours of advanced courses) and General Physics before taking the MCAT in April of their Junior year. These requirements place a heavy lecture and laboratory load on the first two years of the chemistry curriculum. Many students have lighter loads because they qualify for advanced standing in mathematics and languages or through AP credit in introductory courses.

Your total program may be thought of as consisting of (a) liberal arts courses required to assure breadth to your undergraduate education, (b) courses required in the major to assure substantial depth to your education and (c) elective courses chosen by you in light of your personal educational and career goals.

REQUIREMENTS: BA IN CHEMISTRY

This degree is not certified by the American Chemical Society, but it might be the right choice for some students. A hallmark of an undergraduate chemistry program is the right of passage and successful completion of physical chemistry. This degree requires that and is a gateway to many careers, including careers as a professional chemist. This degree is not recommended for those students who know they want to go on to medical school, dental school, or graduate school, because the BS degrees offer stronger preparation for that advanced level of study. **Although it is NOT recommended to put off chemistry in the first semester unless necessary, this scheme illustrates how a student can get back on track if waiting to take CHEM 111 until the spring semester of the freshman year.**

Freshman Year

Pre-Calculus Mathematics	MATH 111	Introductory Calculus	MATH 120
Intro. To Academic Writing	ENGL 110	Principles of Chemistry & Lab	CHEM 111/111L
Elementary Language	LANG 101	Elementary Language	LANG 102
First Year Seminar*	FYSM 1xx	Social Science	XXXX xxx
		History	XXXX xxx
14 credits	0 lab/wk	17 credits	1 lab/wk

*If not enrolled in a Learning Community a student must take a FYSM course during their first year.

Sophomore Year

Principles of Chemistry & Lab	CHEM 112/112L	Quantitative Analysis*	CHEM 221/221L
Calculus II	MATH 220	General Physics	PHYS 112/112L
General Physics	PHYS 111/111L	Calculus III ¹	MATH 221
Intermediate Language	LANG 201	Intermediate Language	LANG 202
15 credits	2 labs/wk	15 credits	3 labs/wk

*CHEM 221/221L is generally also offered in Maymester

Junior Year

Organic Chemistry & Lab	CHEM 231/231L	Organic Chemistry & Lab	CHEM 232/232L
Physical Chemistry & Lab	CHEM 341/341L	Physical Chemistry & Lab	CHEM 342/342L
Social Science	XXXX xxx	Humanities Elective	XXXX xxx
Pre-Modern History	XXXX xxx	Modern History	XXXX xxx
Physical Ed Skill Course	PHED xxx	Social Science	XXXX xxx
Non Credit Chem Resaerch ²	CHEM 397	Non Credit Chem Research ²	CHEM 397
16 credits	2 lab/wk	17 credits	2 lab/wk

Senior Year

Chemistry & Biochemistry Seminar ³	CHEM 490	Senior Seminar	CHEM 492
Introd. to Research I ²	CHEM 481	Introd. to Research I ²	CHEM 482
Humanities Elective	XXXX xxx	Humanities Elective	XXXX xxx
Humanities Elective	XXXX xxx	Elective	XXXX xxx
CHEM Elective ⁴	CHEM 351	Elective	XXXX xxx
Elective	XXXX xxx	Elective	XXXX xxx
15 credits	2 labs/wk	15 credits	2 labs/wk

NOTES

¹ Calculus III, Math 221 is strongly recommended.

² All chemistry students are encouraged to participate in the research program in their junior and senior year. CHEM 397 may be taken before or after CHEM 481. Although not illustrated here, CHEM 499 is generally taken in both fall and spring of the senior year.

³ Chemistry & Biochemistry Seminar (CHEM 490) may be taken twice for credit, but it is strongly recommended student have completed CHEM 232 before enrolling in the course.

⁴ Can be any 3 credit course 3xx or higher, excluding CHEM 583

REQUIREMENTS: BS IN CHEMISTRY

THE PRE-PROFESSIONAL CHEMISTRY PROGRAM. This program leads to an ACS certified Bachelor of Science degree in Chemistry. The sequence of courses below is suggested as an ideal, although students who decide later in their academic career to major in Chemistry may need to alter their schedules. Two courses that are often taken during a summer session are PHYS 111/111L and PHYS 112/112L. Students completing the B.S. in chemistry program are certified by the American Chemical Society. Life Scholarship and other scholarship recipients should be aware of renewal requirements. Honors students substitute HONS Chemistry courses for CHEM courses as described earlier (in Honors Chemistry Course section of this handbook). HONS Physics may also be substituted for PHYS 111/112.

Freshman Year

Principles of Chemistry & Lab	CHEM 111/111L	Principles of Chemistry & Lab	CHEM 112/112L
Pre-Calculus Mathematics	MATH 111	Introductory Calculus	MATH 120
Intro. To Academic Writing	ENGL 110	Elective*	XXXX xxx
<u>Elementary Language</u>	<u>LANG 101</u>	Elementary Language	LANG 102
		<u>Social Science</u>	<u>XXXX xxxx</u>
14 credits	1 lab/wk	17 credits	1 lab/wk

*If not enrolled in a Learning Community a student must take a FYSM course during their first year.

Sophomore Year

Organic Chemistry & Lab	CHEM 231/231L	Organic Chemistry & Lab	CHEM 232/232L
Calculus II	MATH 220	Quantitative Analysis*	CHEM 221/221L
General Physics	PHYS 111/111L	General Physics	PHYS 112/112L
<u>Intermediate Language</u>	<u>LANG 201</u>	<u>Intermediate Language</u>	<u>LANG 202</u>
15 credits	2 labs/wk	15 credits	4 labs/wk

*CHEM 221/221L is generally also offered in Maymester

Junior Year

Chemistry & Biochemistry Seminar ¹	CHEM 490	Physical Chemistry & Lab	CHEM 342/342L
Physical Chemistry & Lab	CHEM 341/341L	Elective	XXXX xxx
Chemical Synth. & Char.	CHEM 371/371L	Humanities Elective	XXXX xxx
Elective ²	MATH 221	Modern History	XXXX xxx
Humanities Elective	XXXX xxx	Social Science	XXXX xxx
Pre-Modern History	XXXX xxx	<u>Non Credit Chem Research³</u>	<u>CHEM 397</u>
<u>Non Credit Chem Research³</u>	<u>CHEM 397</u>		
18 credits	3 lab/wk	16 credits	1 lab/wk

Senior Year

Biochemistry	CHEM 351	Advanced Inorganic Chemistry & Lab	CHEM 511/512L
Instrumental Analysis & Lab	CHEM 521/521L	Intro to Research II ³	CHEM 482
Chemistry & Biochemistry Seminar	CHEM 490	Senior Seminar	CHEM 492
Intro. to Research I ³	CHEM 481	Elective	XXXX xxx
Humanities Elective	XXXX xxx	Humanities Elective	XXXX xxx
<u>Elective</u>	<u>XXXX xxx</u>	<u>Elective</u>	<u>XXXX xxx</u>
16 credits	3 labs/wk	16 credits	3 labs/wk

NOTES

¹Chemistry & Biochemistry Seminar (CHEM 490) may be taken twice for credit.

²Calculus III, Math 221 is strongly recommended.

³All chemistry students are encouraged to participate in the research program in their junior and senior year. CHEM 397 may be taken before or after CHEM 481. Although not illustrated here, CHEM 499 is generally taken in both fall and spring of the senior year.

REQUIREMENTS: BS IN BIOCHEMISTRY

THE PRE-PROFESSIONAL B.S. PROGRAM IN BIOCHEMISTRY. This program leads to an ACS certified Bachelor of Science degree in Biochemistry. The Program includes both chemistry and non-chemistry courses which will prepare the student well for either a career in biochemistry or a career in medicine, dentistry or pharmacy. The program is quite similar to that proposed for the B.S. in Chemistry with the substitution of CHEM 351, 352, and 354L for CHEM 371, 521 and 512L. The 16 credit hours of biology includes BIOL 111/111L, 112/112L, 312/312L and 4 hours to be selected from BIOL 305/ 305L, 310/ 310L, 313/ 313L or 321/312L. Life Scholarship and other scholarship recipients should be aware of renewal requirements. Honors students substitute HONS 153 and 154 for CHEM 111 and 112 and may substitute other Honors Program course work where applicable.

Freshman Year

Principles of Chemistry I & Lab	CHEM 111	Intro. To Academic Writing	ENGL 110
Intro to Cell & Molec. Biol. & Lab	BIOL 111/111L	Principles of Chemistry II & Lab	CHEM 112/112L
Introductory Calculus ¹	MATH 120	Evolution, Ecology, & Biol. & Lab	BIOL 112/112L
Elementary Language	LANG 101	Calculus II	MATH 220
15 credits	2 lab/wk	Elementary Language	LANG 102
		18 credits	1 lab/wk

If not enrolled in a Learning Community a student must take a FYSM course during their first year.

Sophomore Year

Organic Chemistry I & Lab	CHEM 231/231L	Organic Chemistry	CHEM 232/232L
Elective ²	MATH 221	Quantitative Analysis*	CHEM 221/221L
General Physics	PHYS 111/111L	General Physics	PHYS 112/112L
Intermediate Language	LANG 201	Intermediate Language	LANG 202
15 credits	2 labs/wk	15 credits	4 labs/wk

*CHEM 221/221L is generally also offered in Maymester

Junior Year¹

Chemistry & Biochemistry Seminar ³	CHEM 490	Biochemistry Lab	CHEM 354L
Physical Chemistry I & Lab	CHEM 341/341L	Physical Chemistry II & Lab	CHEM 342/342L
Biochemistry I ³	CHEM 351	Biochemistry II	CHEM 352
Molecular Biology & Lab	BIOL 312/312L	Biology Elective & Lab	BIOL 3XX/3XXL
Pre-Modern History	XXXX xxx	Modern History	XXXX xxx
Social Science Elective	XXXX xxx	Humanities Elective	XXXX xxx
18 credits	2 labs/wk	18 credits	3 labs/wk

Senior Year¹

Chemistry & Biochemistry Seminar ³	CHEM 490	Senior Seminar	CHEM 492
Intro. to Research I ⁵	CHEM 481	Intro to Research II ⁵	CHEM 482
Humanities Elective	XXXX xxx	Adv. Inorganic Chemistry	CHEM 511
Humanities Elective	XXXX xxx	Humanities Elective	XXXX xxx
Elective	XXXX xxx	Humanities Elective	XXXX xxx
Elective	XXXX xxx	Elective	XXXX xxx
15 credits	2 labs/wk	15 credits	3 labs/wk

NOTES

¹ Taking MATH 120 may be delayed until second semester if taking MATH 111

² Calculus III, Math 221 is strongly recommended.

³ Chemistry & Biochemistry Seminar (CHEM 490) may be taken twice for credit.

⁴ Pre-medical students are strongly urged to complete at least through CHEM 351, PHYS 111, 112 and if possible 16 credits of biology before taking the MCAT exam in the spring of their junior year.

⁵ All chemistry students are encouraged to participate in the research program in their junior and senior year. CHEM 397 may be taken before or after CHEM 481. Although not illustrated here, CHEM 499 is generally taken in both fall and spring of the senior year.

TIMING FOR CHEMISTRY COURSE OFFERINGS

We expect declared science majors to take the core courses listed on this page **at the College of Charleston**, especially if seeking letters of recommendation from faculty members of our department.

B.S. Chemistry

	When Offered (subject to change)
CHEM 111/111L Principles of Chemistry (with laboratory)	Fall, Spring, Summer I
CHEM 112 /112L Principles of Chemistry (with laboratory)	Fall, Spring, Summer II
CHEM 221/221L Quantitative Analysis (with laboratory)	Fall, Spring, Maymester
CHEM 231/231L Organic Chemistry (with laboratory)	Fall, Spring, Summer I
CHEM 232/232L Organic Chemistry (with laboratory)	Fall, Spring, Summer II
CHEM 341/341L Physical Chemistry (with laboratory)	Fall only
CHEM 342/342L Physical Chemistry (with laboratory)	Spring only
CHEM 351 Biochemistry	Fall, Spring
CHEM 371 Chemical Synthesis and Characterization	Fall only
CHEM 490 Chemistry and Biochemistry Seminar	Fall only
CHEM 492 Senior Seminar	Spring only
CHEM 511 Advanced Inorganic Chemistry	Spring only
CHEM 512L Advanced Inorganic Chemistry Laboratory	Spring only
CHEM 521/521LL Instrumental Analysis (with laboratory)	Fall only
PHYS 111 and 112 General Physics (with laboratory)	
MATH 220 Calculus II	

B.A. Chemistry

CHEM 111/111L Principles of Chemistry (with laboratory)	Fall, Spring, Summer I
CHEM 112 /112L Principles of Chemistry (with laboratory)	Fall, Spring, Summer II
CHEM 221/221L Quantitative Analysis (with laboratory)	Fall, Spring, Maymester
CHEM 231/231L Organic Chemistry (with laboratory)	Fall, Spring, Summer I
CHEM 232/232L Organic Chemistry (with laboratory)	Fall, Spring, Summer II
CHEM 341/341L Physical Chemistry (with laboratory)	Fall only
CHEM 342/342L Physical Chemistry (with laboratory)	Spring only
CHEM 492 Senior Seminar	Spring only
Elective: one three-hour course at the 300 level or above, exclusive of CHEM 583.	
PHYS 111 and 112 General Physics (with laboratory)	
MATH 220 Calculus II	

B.S. Biochemistry

CHEM 111/111L Principles of Chemistry (with laboratory)	Fall, Spring, Summer I
CHEM 112 /112L Principles of Chemistry (with laboratory)	Fall, Spring, Summer II
CHEM 221/221L Quantitative Analysis (with laboratory)	Fall, Spring, Maymester
CHEM 231/231L Organic Chemistry (with laboratory)	Fall, Spring, Summer I
CHEM 232/232L Organic Chemistry (with laboratory)	Fall, Spring, Summer II
CHEM 341/341L Physical Chemistry (with laboratory)	Fall only
CHEM 342/342L Physical Chemistry (with laboratory)	Spring only
CHEM 351 Biochemistry	Fall, Spring
CHEM 352 Biochemistry II	Fall, Spring
CHEM 354L Biochemistry Laboratory	Fall, Spring
CHEM 490 Chemistry and Biochemistry Seminar	Fall only
CHEM 492 Senior Seminar	Spring only
CHEM 511 Advanced Inorganic Chemistry	Spring only
BIOL 111/111L Introduction to Cell and Molecular Biology (with laboratory)*	
BIOL 112/112L Evolution, Form, and Function of Organisms (with laboratory)*	
BIOL 312/312L Molecular Biology (with laboratory)	
PHYS 111 and 112 General Physics (with laboratory)*	
MATH 220 Calculus II	

Four hours in advanced laboratory courses selected from:

BIOL 305/305L Genetics (with laboratory)
BIOL 310/310L General Microbiology (with laboratory)
BIOL 313/313L Cell Biology (with laboratory)
BIOL 321/321L General and Comparative Physiology (with laboratory)

HONORS CHEMISTRY COURSES

Students in the [Honors College](#) are encouraged to take Honors Chemistry courses. Beginning in the fall of 2011 we will be offering a new set of HONS Chemistry courses. Prior to the fall of 2011 we offered HONS 153/153L in the fall semester and HONS 154/154L in the spring semester. These two courses were equivalent, in terms of meeting degree requirements, to CHEM 111/111L and CHEM 112/112L. The new Honors Chemistry sequence is known as a 1:2:1 curriculum. The new HONS Chemistry courses are HONS 191/191L, HONS 192/192L, HONS 293/293L, and HONS 294/294L. In this new Honors Chemistry sequence, the equivalencies of the HONS Chemistry courses to CHEM courses is shown here:

HONS 191/191L = CHEM 111/111L
HONS 192/192L = CHEM 231/231L
HONS 293/293L = CHEM 232/232L
HONS 294/294L = CHEM 112/112L

HONS 191/191L is to be taken in the first fall semester. HONS 192/192L is to be taken in the subsequent spring semester. HONS 293/293L is to be taken in the second year fall semester. HONS 294/294L is to be taken in the spring semester of the second year. There are a limited number of seats for the HONS chemistry courses, with registration for HONS 191/191L based on permission of the chair after evaluation of student performance in an AP High School Chemistry course.

SPECIAL TOPICS COURSES

Special courses are offered as CHEM 583 or CHEM 583L. The pre-requisites for CHEM 583/583L depend upon the specific offering. In the past several years special topics courses have included a CHEM 583 lecture in Chemical Biology (focused on RNA/DNA biochemistry), CHEM 583L laboratory on Biochemistry Research Methods, CHEM 583 lecture on the Chemistry of Beer and Wine, CHEM 583 on Research Project Management.

PRE- PHARMACY STUDENTS

Students interested in a pharmacy or related career need to complete 67 semester hours of preparatory course work before transferring to a pharmacy program. It is important that the students strive to do as well as possible in all of these courses, because their acceptance into the program depends upon their overall grade-point average and their grade-point average in sciences. Persons evaluating records of potential transfer applicants are favorably impressed when they see "B" or better in courses. **Student interested in this or any other career in health professions should make an appointment to meet with the College of Charleston's Pre-Health Professions advisor, Karen Eippert (eippertk@cofc.edu, Room 132 NSCB)**

While it is possible for prospective pharmacy students to be admitted (averaging 17 hours per semester) after two years of study at the College of Charleston, it is also possible to be admitted at any time after that, and some students have elected to complete a B.S. in either biochemistry or chemistry. Students should consult the pharmacy schools to which they intend to make application for specific admission requirements in regards to course work and admissions tests as well as for application deadlines.

Entry level Doctor of Pharmacy prerequisites at the Medical University of South Carolina are shown here:

Prerequisites for entry into MUSC	Hours Req.	C of C equivalents
Principles of Chemistry	8 hrs	CHEM 111-112 with labs
Organic Chemistry	8 hrs	CHEM 231-232 with labs
Physics	6 hrs (8 hrs)	PHYS 101-102 or 111-112 (CofC requires labs as co-requisites)
General Biology	8 hrs	BIOL 111-112 with labs
Human Anatomy / Physiology	6 hrs	BIOL 201 - 202
Calculus	3 hrs (4 hrs)	thru MATH 120 (4 hrs at CofC)
Statistics	3 hrs	MATH 104 or 250
English Composition	3 hrs (4 hrs)	ENGL 110 (4 hrs at CofC)
Literature	3 hrs	ENGL 201 or 202 or ENGL 207
Economics	3 hrs	ECON 101 or 201 or 202
Psychology	3 hrs	PSYC 103
Verbal Skills	3 hrs	COMM 220 or COMM 104
Liberal Arts Electives	9 hrs	prefer social sciences only
TOTAL	66 hrs (70 hrs)	

Note: These courses are for student planning to apply to South Carolina College of Pharmacy (MUSC or USC <https://portal.sccp.sc.edu/public/prepharmacy/default.aspx>) for the PharmD program. The PharmD programs at other schools may have slightly different admission requirements. These schools should be contacted for their particular admissions requirements. Students should contact MUSC or visit their website for application procedures, deadline dates, and any changes in the admissions requirements or the articulation agreement. The College of Charleston is not responsible for the accuracy of the content of this page. One advantage of completing the undergraduate bachelor's degree requirements at the College of Charleston and then taking the PCAT and the Graduate Record Examination is that it allows you the option to pursue more advanced degrees (MS or PhD) in graduate programs in Pharmaceutical Sciences or other biomedical areas. This path is especially recommended for anyone interested in research.

MINOR IN CHEMISTRY

It is also possible for a student to major in another discipline and minor in chemistry. Many of these students have already taken or elected to take a year of general and organic chemistry courses and at least one semester of biochemistry. By this time, they are already within a course or two of completing the requirements for a minor in chemistry. The option to minor in chemistry becomes even more attractive, because it increases their chances for full-time or part-time employment after graduation, even if they are assured of admission to a graduate or professional school program.

The student is required to complete 15 hours of chemistry beyond second semester general chemistry, CHEM 112/112L, for a total of 23 hours. These hours must include quantitative analysis, CHEM 221/221L, **either** a full year of organic chemistry, CHEM 231/231L, 232/232L, **or** a full year of physical chemistry, CHEM 341/341L, 342/342L, **plus** 3 hours of chemistry electives at the 300 level or above (e.g., CHEM 351, biochemistry).

DOUBLE MAJOR OR SECOND BACHELOR'S DEGREE

The requirements for earning a double major or a second bachelor's degree are spelled out in the College of Charleston undergraduate catalogue. A second major requires at least an additional 30 credit hours, for a minimum of 152 earned credit hours. Double majors must meet requirements of both degrees. Read over the official College of Charleston catalog for clarification.

MINOR IN BIOLOGY

Biochemistry majors often are able to complete a [minor in biology](#). You should consult the Undergraduate Bulletin to see the current requirements for obtaining a minor in Biology.

MINOR IN ENVIRONMENTAL STUDIES

The [Environmental Studies minor](#) is offered for students who have an interest in learning more about the natural environment and ecology of the planet, as well as gaining an understanding of the relationship of political, social, cultural, and economic activities to the environment. The minor requires a minimum of 19 hours. A list of requirements may be obtained from the Department of Biology office.

PREPARATION TO TEACH HIGH SCHOOL CHEMISTRY

The certification required to teach in public schools is recommended for anyone interested in [teaching chemistry at the high school level](#). This program is administered by the School of Education, Health & Performance at the College of Charleston. You are required to be a DOUBLE major, one major must be in Secondary Education, the other must be in the content area in which you want to teach. For Chemistry this means you must satisfy the degree requirements for the BA in Chemistry, although you could exceed those minimum requirements and earn a BS in Biochemistry or a BS in Chemistry.

PREPARATION FOR FORENSICS

Students who want to pursue careers in law enforcement or as forensic chemists can earn a BS in Chemistry or Biochemistry. There are degree programs at other schools that specialize in forensics, but our graduates have done quite well, in fact they are directing crime laboratories with degrees in fundamental chemistry. We encourage students interested in this area to take relevant elective course work on policy, law and philosophy. We also encourage students interested in this career track to pursue co-operative opportunities in crime labs.

AMERICAN CHEMICAL SOCIETY CERTIFICATION

The Department of Chemistry and Biochemistry of the College of Charleston offers two degrees that are accredited by the Committee on Professional Training of the American Chemical Society. These are the BS in Chemistry and the BS in Biochemistry. The BA in Chemistry is not a certified degree, and the minor is not certified. The advantage of the certified degree is that graduate schools and professional schools around the country and across the globe accept ACS certified degrees as providing adequate topical coverage and laboratory experience to meet the needs expected of a well-trained undergraduate. <http://portal.acs.org/portal/acs/corg/content>

POLICY ON SCIENTIFIC INTEGRITY

College of Charleston

Department of Chemistry and Biochemistry

August 16th, 2010

Policy on Scientific Integrity

"The essence of science is the pursuit and transmission of knowledge, an endeavor that depends upon honesty, objectivity, intellectual freedom, and trust over generations, across disciplines, and across national borders. As every researcher depends on the validity of others' previous work, and because no single individual can master every dimension of any field, the practical demands of science reinforce an inherently moral social contract among researchers"—from "The Ethical Dimensions of the Biological Sciences" ¹

Laboratory courses are the core of our chemistry curriculum. You will be learning specific skills while actively practicing the methods of scientific inquiry. You are encouraged to engage your peers and challenge each other's understanding as part of this learning experience. At all times, however, we expect that you will hold yourselves to the rigorous standards demanded by the aforementioned "moral social contract among researchers". You are expected to:

- Keep an open, objective mind while carrying out experiments
- Keep dated, accurate records of your experiments in pen
- Cross off errors in notebook calculations rather than erasing, whiting out, or obliterating them
- Carry out your own experiments without bias to an expected outcome
- Carry out replicate experiments when time permits
- Report your findings without embellishing, altering or ignoring data you have collected
- Make your own graphs, data tables, and interpretations when authorized to collect data in groups (unless you are told otherwise by the instructor)
- Work independently to derive your own conclusions
- Write in your own words the interpretation of your data
- Cite appropriately any published materials such as handbook data, journal articles, web sites, or textbooks that were used to aid with your data interpretation³
- Formally acknowledge and state the identities of those who have provided ideas that have aided in your interpretations

The National Academy of Sciences' Panel on Scientific Responsibility and the Conduct of Research makes the following definition: *"Misconduct in science is defined as fabrication, falsification, or plagiarism, in proposing, performing, or reporting research. Fabrication is making up data or results, falsification is changing data or results, and plagiarism is using the ideas or words of another person without giving the appropriate credit."*²

Because scientific integrity is central to all scientific endeavors, the faculty will vigorously prosecute any student thought to be in violation of scientific ethics at the College's Honor Board. The following acts are examples of scientific misconduct that will not be tolerated:

- Modifying data to conform to an expected outcome
- Copying another student's data into your own notebook or report
- Using another student's interpretation and presenting it as your own
- Using or possessing previously interpreted data or graded reports from this lab course
- Providing your data or graded lab reports to another student who presents it as their own
- Presenting data collected in prior semesters for credit in the present semester

If there is any doubt as to the proper interpretation of what is allowed under this code of scientific integrity, you should consult your instructor before submitting any work for evaluation.

For a first offense, unless the instructor feels there is evidence or belief of deception, an admission of violation *prior to the scheduling of a hearing* will result in a grade of zero being assigned to that assignment. The grade of zero and the admission of violation will be reported to the Honor Board using the Class III Report and Resolution form. Conviction of a violation by the [Honor Board](#) or an admission of a violation once a hearing has been scheduled will result in a grade of "XF" being assigned for the course. In the cases with perceived deception, with or without admission of violation, the instance will be referred directly to the Honor Board.

Signature

Date

By my signature I acknowledge having read and understood the Policy on Scientific Integrity of the Department of Chemistry and Biochemistry of the College of Charleston.

¹ *The Roots of Honor and Integrity in Science. In The Ethical Dimensions of the Biological Sciences*; Cambridge University Press: Cambridge, U.K.; Bulger, R.E.; Heitman, E.; Reiser, S.J., Eds.; **1993**; p. 41.

² Panel on Scientific Responsibility and the Conduct of Research, National Academy of Sciences. *Methods, definitions, and basic assumptions. In The Ethical Dimensions of the Biological Sciences*; Bulger, R.E.; Heitman, E.; Reiser, S.J., Eds.; Cambridge University Press: Cambridge, U.K.; **1993**; p. 108.

³ A good source is *The ACS Style Guide: A Manual for Authors and Editors*, Dodd, J.S., Ed.; American Chemical Society: Washington, DC

DEPARTMENTAL POLICY FOR CARE OF LABS

The Department of Chemistry will generally supply the equipment and chemicals needed to safely perform experiments in the laboratory. When the student enters a laboratory room, the student becomes responsible for the care of all of the supplies and equipment in that laboratory during the lab period. Any items that are damaged must be reported to the instructor, and replaced as soon as possible. All glassware and equipment should be as clean, or cleaner, at the end of the laboratory period than at the beginning of the laboratory period. All hoods and bench tops and balance areas and work areas should be as clean, or cleaner, at the end of the laboratory period than at the beginning of the laboratory period.

When a student checks into a laboratory all equipment needed should be present, in a specified location (drawer, locker, shelf, common hood, etc.) and in good condition. If an item is damaged or missing, it should be reported immediately to your laboratory instructor. Your laboratory instructor will determine if an item is damaged but usable. It is the joint responsibility of the stockroom and the instructor designated as the coordinator for all sections of the courses to make sure that each laboratory room is adequately supplied BEFORE the start of the first meeting of a laboratory course each week.

The student is then responsible for returning all of the clean, functioning items to the proper location before leaving the laboratory. It is the instructors' responsibility to see that in fact the students have done the above.

Students should immediately clean any chemical spills in the laboratory, including at their bench tops, in hoods, or in common areas. Balances, in particular, should be cleaned carefully after each use. Ask your instructor if you are uncertain of how to safely clean up a spill.

DEPARTMENTAL POLICY ON SAFETY

College of Charleston - Department of Chemistry and Biochemistry - Laboratory Safety Rules

No one (volunteer or paid, faculty, student or staff) will be allowed in a laboratory with the intent to conduct chemical work or where chemical work may be in progress unless these regulations are followed. For the purposes of this policy chemical work can be defined as the use or handling of chemicals or apparatus for all aspects of experimentation (set up, pouring, mixing, stirring, reacting, monitoring, cleaning up, inventory, etc.). If you are dismissed from a lab due to violations of the safety procedures you will not be allowed to re-enter the laboratory until authorized to do so by your supervisor (instructor) and, in the case of research laboratories, by the department chair or designee. Any course work missed because of a violation of these policies cannot be made up at another time (or by an extension of the lab period) and will be treated as an unexcused absence.

1. The Chemistry Department dress code for laboratory work is as follows:
 - a) Wear safety glasses or goggles at all times
 - b) Closed toe shoes, heel and top of foot must be covered (no high heels)
 - c) No exposed skin on arms, legs or torso.
 - d) Wear lab coats.
 - e) Gloves or other protective equipment as directed by the instructor or mandated by prudent practices based on chemicals being handled. If in doubt, wear gloves.
 - f) Tie back long hair.
 - g) Remove gloves before leaving lab.
 - h) Remove lab coats before entering eating or drinking areas.
 - i) Wash your hands, even if gloves were used, before leaving a lab where you did any lab work.
2. Know the physical and chemical hazards associated with the materials that are being utilized in the lab.
3. Before leaving a lab, make sure it is clean and organized.
 - a) The entire lab (including glassware) should be cleaner when you leave than when you entered.
 - b) The entire lab must be organized, stocked and ready for the next use before you leave it.
 - c) If you walk into a lab that is messy, disorganized or has chemicals improperly labeled or stored, inform your instructor and notify the stockroom (953-7811) or main office (953-5587).
4. Never perform any hazardous work when alone in the laboratory. An instructor must supervise undergraduate students when performing hazardous work.
 - a) In the case of 100 and 200 level teaching labs no student is allowed to enter the lab unless the instructor is present.
 - b) In the case of 300 and higher teaching labs, no student is allowed to enter the lab alone. Students can only perform experiments with the explicit permission of the instructor.
 - c) In the special case of a research lab environment, there MUST be at least one other chemist (faculty, student or staff) in the lab at all times AND there must be a faculty supervisor in the building who has actively declared willingness and ability to assume responsibility and provide support or guidance as needed.
5. Never perform unauthorized lab work including preparations for experiments, conducting or monitoring experiments, or cleaning up after an experiment.
6. Never engage in horseplay, pranks or other acts of mischief in chemical work areas.
7. Never remove chemicals or laboratory equipment from a lab without proper authorization.
 - a) Do not take or borrow, without authorization, from one lab to serve the needs of another.
 - b) Immediately report the authorized relocation of all equipment and chemicals to the stockroom.
8. Know the location of emergency equipment in the lab - fire alarm, fire extinguisher, emergency eyewash and safety shower.
9. Know the appropriate emergency response procedures. If there is an injury, call 953-5611.
10. Use equipment and hazardous chemicals only for their intended purposes.
11. Use a hood whenever there is a possibility of poisonous or irritating fumes being emitted from the chemicals being utilized. Assume that all chemicals used in research are bad for you and the environment, unless proven otherwise.
12. Never leave an experiment unattended while it is being heated over an open flame or is rapidly reacting. For water cooled reactions left overnight, the water connections must be held in place with wire or another suitable means to prevent flooding.

DEPARTMENTAL AWARDS/SCHOLARSHIPS

The Department of Chemistry and Biochemistry at the College of Charleston offers a number of awards and honors to students in all classes based on scholarship, leadership and academic activities within the Department. These awards take the form of engraved cups, departmental plaques, certificates, chemistry journal subscriptions, and monetary gifts. Many of these awards are described in more detail in the Bulletin of the College of Charleston.

Departmental scholarship recipients must attempt a minimum of 15 credit hours per semester with at least three credit hours being CHEM courses. A 3.0 GPA must be maintained and at least 30 credit hours must be earned per academic year. No student may receive a scholarship beyond 4 years or while seeking a second degree. Scholarships are dependent upon income generated from endowments and may or may not be available in any given year.

Outstanding Student in Chemistry Award

This award is given to the outstanding graduating chemistry student selected by the Department of Chemistry and Biochemistry faculty on the basis of his/her accomplishments as an undergraduate. Emphasis is placed on the student's overall academic record and their accomplishments in contributions to the Department and research activities. The award is sponsored by the College of Charleston.

Outstanding Student in Biochemistry Award

The award is given to outstanding graduating biochemistry students selected by the Department of Chemistry and Biochemistry faculty on the basis of their accomplishments as undergraduates. Emphasis is placed on the student's overall academic record and their accomplishments in contributions to the Department and research activities. This award is sponsored by the College of Charleston and the Department of Chemistry.

Departmental Honors

Departmental Honors may be earned in either chemistry or biochemistry. A student must complete at least 12 hours of courses at the 400 level or above, which must include CHEM 481 and 482, have a minimum 3.5 GPA in the major, and performed undergraduate research culminating in a written report or complete a bachelor's essay.

South Carolina Section of the American Chemical Society - Outstanding Student Award.

This award is given by vote of the faculty to the outstanding chemistry or biochemistry student of the senior class. The award is presented at the Section's annual banquet.

The Mary and Carl Likes Physical Chemistry Award

The award is given in recognition of academic excellence in the study of physical chemistry as demonstrated by lecture and laboratory performance in CHEM 341/341L and CHEM 342/342L and by demonstration of leadership abilities, participation in departmental activities, willingness to share knowledge with others, honesty, optimism, responsibility, and serious endeavor. The sponsors of this award are Alpha Chi Sigma and the Friends of Carol and Mary Likes.

Elizabeth M. Martin Award

The award is given to the outstanding graduating chemistry major who is minoring in secondary education. This award is sponsored by the Department of Chemistry and Biochemistry.

The Organic Chemistry Award

The award is given for excellence in organic chemistry to the two students who make the highest score on the American Chemical Society standard examination in Organic Chemistry given at the end of CHEM 232. This award is sponsored by the Department of Chemistry.

The Analytical Chemistry Award

Selection of the recipient is made by the analytical faculty from among students majoring in chemistry who have an outstanding interest and ability in analytical chemistry. This award is supported by the Analytical Chemistry Division of the American Chemical Society.

The Quantitative Analysis Award

This award is given to the student who earns the highest score on the American Chemical Society standardized examination in Quantitative Analysis given as the final examination in CHEM 221. The Department of Chemistry sponsors this award.

The Freshman Chemistry Award

This award is given to the four students who earn the highest scores on the American Chemical Society standardized examination in General Chemistry given as the final examination in CHEM 112. The Department of Chemistry sponsors this award.

Brewer Scholarship

The scholarship recipient is selected by the Faculty of the Department of Chemistry and Biochemistry from among the junior and senior chemistry and biochemistry majors who are South Carolina residents and have demonstrated ability in chemistry, are of honorable character and show promise for future excellence. The scholarship is a donation of Mr. and Mrs. O. W. Brewer in appreciation for the education received by their son and daughter-in-law, Drs. Greg and Cindy Brewer, B.S. chemistry majors at the College of Charleston.

The American Institute of Chemists and Chemical Engineers Award

This award is given annually by vote of the chemistry faculty to a student who has shown a strong interest in the field of chemistry and has demonstrated the qualities of scholarship, leadership and integrity that characterize successful professionals in the discipline of chemistry. The award is sponsored by the American Institute of Chemists and Chemical Engineers.

The Edward Emerson Towell Chemistry Scholarship

This scholarship has been established in honor of Dr. Edward E. Towell, by his former students and colleagues. It is normally awarded to an entering freshman, who has elected to major in Chemistry or Biochemistry. They are renewable for four years as long as standards for continuation are met. Criteria for consideration for the scholarship include: [1] application and acceptance to the College of Charleston; [2] declaration of major in either Chemistry or Biochemistry; [3] an outstanding high school record as evidenced by being in the top 5% in high school class rank, or by scoring above 1200 in the S.A. T.; [4] a strong interest in science as evidenced by advanced science courses and science related extra-curricular activities; and [5] a letter of recommendation from the student's high school chemistry teacher.

Major Field Test Award

The award is given to all seniors who score at the 90th percentile or higher on the Major Field Test of the Educational Testing Service that is administered to all graduating seniors in CHEM 492 Chemistry Seminar.

Lense Scholarship

The scholarship recipient is selected by the Faculty of the Department of Chemistry and Biochemistry from among junior and senior chemistry and biochemistry majors. The scholarship was endowed by Mr. and Mrs. Howard Iserman in honor of Frederick Lense.

Laurence O. Williams Scholarship in Chemistry

This scholarship recipient is selected by the Chair from among junior or senior BS CHEM majors with a GPS of 3.5 or higher and an interest in pursuing a career in chemistry. This is a non-endowed scholarship given by Mrs. Williams in memory of her husband.

Appendix I (web version only): Departmental Instrumentation

Instrument, date acquired	Location
NMR	
Varian 300 MHz FT-NMR, 1997	Room 319
Mass Spec	
ThermoFinnigan LCQ LC-MS, 2006	Room 338
Agilent 7890A / 5975C GC-MS, 2009	Room 338
Hewlett-Packard 5890/5971 GC-MS, 1990	Room 338
Liquid Chromatography	
Waters 515/2487 (2), 1998	Room 330
Varian 2510/2550, 1988	Room 349
Malvern GPC, 2011	Room 103
Capillary Electrophoresis,	Room 321
UV-Vis / Fluorescence	
Agilent 1200 LC-PDA, 2008	Room 349
Waters LC-PDA, 1996	Room 330
Perkin Elmer LS50B, 1991	Room 321
Storm Phosphorimager, 2010	Room 307
Varian Cary 50 Conc (4), 2010	Room 311
Hitachi (2), 1996	Room 311A
Imaging Microscopy	
LSM Zeiss Laser Confocal Microscope, 2010	Room 331
Atomic Absorption	
ThermoScientific ICE300, 2008	Room 323A
Electrochemical	
Epsilon Analyzer, 2007	Room 321
IR	
Bruker Alpha (4), 2008	Rooms 105, 109, 333
Perkin Elmer Spectrum 100, 2007	Room 329
GC	
Scientific Research Instruments, FID (4), 2005	Rooms 105, 109
Hewlett Packard 5890 with FID (2)	Room 321

Polarimetry

Rudolph AUTOPOL IV, 2002 Room 333

Microwave

CEM MARS Synthesis, 2009 Room 109

CEM Discover, 2006 Room 334

Environmental Chambers

ES2000, 2007 Room 349

Cincinatti SubZero, 2010 Room 349

Autoclave

Steris AmscoLabs 250, 2010 Room 311B

Radiation Detector

Spectech 350, 2002 Room 336

Ge Detector, Canberra DSA100, 2003 Room 336

Centrifuge

Sorvall Evolution, 2001 Room 311

Lasers

Ar ion, Coherent Innova 70, Room 331

N₂ YAG, 2011 Room 331

Glove Bags/Boxes

Coy Instruments Vinyl Glove Bag, 2006 Room 305

MBraun Unilab, Glove Box, 2001 Room 333B

Chromatotron

Harrison Scientific (2), 1989, 2003 Room 334

Appendix II (web version only): Graduates of the Department

Coming soon

Appendix III (web version only): Bachelor's Essay Directions

GUIDE FOR THE PREPARATION OF BACHELOR'S ESSAY: CHEM 499

Course Description Statement in College of Charleston Catalog

“A year-long research and writing project done during the senior year under the close supervision of a tutor from the department. The student must take the initiative in seeking a tutor to help in both the design and the supervision of the project. A project proposal must be submitted in writing and approved by the department prior to registration for the course.”

Departmental Directives:

The writing phase of this project is not to be initiated during the last semester prior to spring semester graduation. If laboratory research is involved, the project must be approved during the fall semester, and preferably before November 1. The completed first copy should be ready for review and correction by March 1, and the final copy should be completed by April 1. Departmental approval of the completed manuscript must be obtained before the end of the spring semester. The final determination of deadlines and target dates will be made by the research director, when the results of a laboratory research project become the focus of a Bachelor's Essay manuscript.

The guidelines are presented on the following pages in the following sections:

- Introduction
- General Requirements
- Technical Instructions
- Format
- The Main Elements of the Essay

I. INTRODUCTION

A Bachelor's Essay is a permanent record of information gained through study and research. It is the final culmination of the student's efforts, coupled with those of his/her advisor and the department. The Bachelor's Essay reflects upon the credibility of all those concerned and upon the College of Charleston as well.

This guide for preparation of a Bachelor's Essay is designed to assist the student in the organization and presentation of his/her material. Further, it ensures reasonable consistency of format and complete and coherent reporting of the research.

It is preferred that an Essay be prepared in the format of the intended journal of publication of a research project or projects. This may require some alteration of the requirements stated herein; however, any deviation in presentation requirements must be with the approval of the advisor and department.

II. GENERAL REQUIREMENTS

Number of Copies:

Each participant shall submit five complete and signed copies of his/her Bachelor's Essay to the Department and Advisor as follows:

- Copy 1 - College of Charleston Chemistry Department
- Copies 2 and 3 - Bachelor's Essay Advisor
- Copy 4 - Student
- Copy 5 - College of Charleston Library

Format for Bachelor's Essay:

The Bachelor's Essay shall consist of the following components in the order listed below*:

1. Cover Sheet
2. Title and Approval Page
3. Acknowledgments
4. Table of Contents
5. List of Tables
6. List of Figures/Diagrams/Pictures (when applicable)/Scheme Drawings of Chemical Structural Formulas [It is not necessary to list single structural formulas or organic chemical equations. The formula must be clearly numbered and described in the narrative text. Equations should also be numbered.]
7. Abstract
8. Text
 - a. Introduction
 - b. Results and Discussion
 - c. Summary and/or Conclusion
 - d. Experimental Section
9. Literature Cited
10. Appendices (where appropriate)

* *Details pertinent to each of these items are included in the following pages.*

III. TECHNICAL INSTRUCTIONS

Original Manuscript: The original manuscript shall be prepared, using 21.6 x 28 cm (8.5x11 inches) white bond paper of twenty (20) pound weight, 100% rag content. The utilization of a word processor and laser printer is quite acceptable and highly recommended.

Copies: The additional copies to be presented must be clean, clear photocopies on at least 20% rag content, acid-free paper. Laser printed copies are certainly acceptable and highly recommended.

Type: Microsoft Word or comparable processing/preparation software is required. Manuscripts font should be font size 12, Roman, Times New Roman and of medium weight and proportion. Print the manuscript using premium letter quality settings.

Structures & Figures: The use of ChemBioDraw or comparable software is required.

Appearance: Clean copies, free of strike-overs or obvious erasures must be submitted. Special symbols may be added using India or permanent black ink. All signatures must be in permanent black ink. The utilization of a work processor and laser printer (avoid ink jet printers) would ensure quality presentation of material, and both are highly recommended.

Margins: The left-hand margin, the binding margin, must be 3.65 cm (1.5 inches). The top and bottom margins must be 2.5 cm (1 inch) except the top margin of the first page of each new section which must be 5 cm (2 inches). The right-hand margin must be approximately 2.5 cm (1 inch). The right margin must not be justified.

Spacing: All material in the manuscript text (including abstract), literature cited, table headings and figure legends will be double-spaced, if a typewriter is used, or 1.5 spaced if ChemBioDraw or other appropriate word processing is used. Each section will begin a new page. All headings must be centered, with all words capitalized. Each paragraph must be indented five (5) spaces. Do not end a line of text with a hyphen.

Pagination: Each page except the cover sheet has a number (whether it appears or not). The Title page is page one (lowercase Roman numeral one), not expressed. All preliminary pages are lowercase Roman numeral, numbered in sequence. The Introduction of the text is page 1, Arabic, not expressed. All subsequent page numbers appear, except on the first page of each new section. All numbers shall be centered at the bottom of the page 11.25 cm (0.5 inch) from bottom, set of with hyphens, e.g., -5-.

Proofing: Accuracy in proofing is the student's responsibility. Careful proofreading of draft versions, including careful checking of Literature Cited against the text is mandatory. Extra care should be used, to ensure good grammar, punctuation, and spelling. The student, his/her advisor and one additional faculty member should be involved in proofing/editing manuscripts.

Matters of Rhetoric: Matters of rhetoric must be given careful attention. It is assumed that a student has developed sufficient writing skills to guarantee usage of the English language with clarity and facility. Lack of attention to inflection and syntax may well diminish the value of the Essay and often makes it invalid. Students will find it profitable to refer to (1) a handbook of composition, (2) a dictionary, and (3) a thesaurus. Use of software spell checking and thesaurus features is strongly recommended and encouraged.

IV. CONTENT

Cover Sheet: The cover sheet is a blank sheet which precedes the title page.

Title and Approval Page: The title and approval page should follow the exact format of an appropriate page designed by the student advisor and department chairman. The following should be completely capitalized: Title, Author, Department, Date, and "Approved by." This page is not numbered but is counted in the numbering of subsequent pages.

Acknowledgments: In this section, the student will give credit to persons or organizations who aided in the planning and conduct of the research and Essay preparation and review. Credit should also be given for financial aid such as grants. This section is normally only one concise paragraph.

Table of Contents: This section contains a listing of each major division and any subdivisions which occur indicating the page on which each begins. The divisions should be completely capitalized. Subdivisions should be indented five (5) spaces and only the first letter in each word should be capitalized. The Table of Contents page is numbered using lowercase Roman numerals. If the word processing program Heading font formatting feature and footer page numbering features are used, creation of the Table of Contents is greatly simplified.

List of Tables: This section contains a listing of all tables included in the Essay and the page on which each is located. The titles of the tables may be shortened versions of the actual title (but avoid exact duplication of title). The list of tables page is numbered using lowercase Roman numerals.

Lists of Figures/Diagrams/Pictures (when applicable)/Drawings of Chemical Structural Formulas: This section contains a listing of all figures, diagrams, etc. included in the Essay and the page on which each is found. The titles of figures, drawings, etc., may be shortened versions of the actual legends (but avoid exact duplication of title). The list of figures/diagrams, etc., page is numbered using lowercase Roman numerals. It is not necessary to list single structural formulas or organic chemical equations. The formulas must be clearly numbered and described in the text. Equations should also be numbered.

Abstract: The abstract is a concise, informative summary of the Essay, emphasizing new information and the relevance of the work. It should normally not exceed 3% of text length but the requirements of the journal to which the Essay may be submitted should serve as the primary guide. Normally, an abstract should not exceed a single page.

V. The Main Elements of the Essay:

Introduction: The purpose of the introduction is to introduce the reader to the problem. The Introduction is a concise statement of the problem and an outline of the scope, aim, and nature of the research. The significance/importance of the project should be included here. It should also include a review of the literature pertinent to the subject.

Results and Discussion: The results reflect the findings of the student's investigation only, not the findings of other researchers in the area. This is a summarized form of extensive data that may appear in the figures, tables and/or appendices. The discussion is designed for an analysis of the data acquired. In this section, the student may draw comparisons with findings of other researchers in the field, or even speculate to some degree, and, if appropriate, suggest additional research.

Summary and/or Conclusion: The Summary and/or Conclusion is (are) a final brief statement which draws together the objectives and findings of the entire research project. Care should be exercised to draw conclusions pertinent to the problem and to avoid personal bias.

Experimental Section: A trained scientist should be able to reproduce the successful experiments that are germane to the research project. They should be written in a manner acceptable to a standard refereed journal, such as the *Journal of the American Chemical Society*. Obviously, there are differences in format for journals, and the journal format should be stated.

Tables: Text material should not duplicate that in tables. Each table should be on a separate sheet. Each should have a short but amply descriptive title enabling the reader to understand the table without reference to the text.

Figures: A figure legend shall be placed on a separate page from the figure and positioned so that the legend faces the figure. Only the legend page is numbered, with the page number placed at the bottom center of the legend page.

Literature Cited: The style and format of this section will ordinarily depend on the practice of the journal to which the paper based on the Essay is submitted. The Advisor has the option of requesting the inclusion of titles of all references cited. The use of EndNote or comparable ad-in software to Word is highly recommended.

Appendices: This section may or may not be an appropriate inclusion in the Essay depending upon the individual problem. It provides a section for materials which are inappropriate for the text. It also may include Tables, Figures, etc. If the work contributed to a manuscript that has been submitted for publication, or is in press, then the prepublication manuscript can be included here. This prepublication manuscript can be replaced by a publication reprint at a later date. Its inclusion will be determined by the student and the advisor.