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I. BIOCHEMISTRY CURRICULUM SHEET
II. SAMPLE FOUR YEAR SCHEDULE
III. LIST OF APPROVED ADVANCED COURSES
IV. FINDING STUDENT INTERNSHIPS
INTRODUCTION

The purpose of this handbook is to introduce you to the Department of Biochemistry at the University of Illinois in Urbana-Champaign, to outline the requirements for the Baccalaureate degree in Biochemistry, and to tell you about career options in biochemistry. Biochemistry is an advanced, interdisciplinary field that encompasses the biological sciences, physics, and chemistry. The Biochemistry curriculum is technical in nature in that it focuses on the molecular and atomic basis of biological problems. The program targets in-depth preparation for students with well-defined career goals in biochemistry laboratory research, medicine, joint MD/PhD aspirations, as well as the fusion of science with business, law, writing, and other disciplines. Jeff Goldberg, Senior Coordinator of Student & Academic Affairs (Room 419A Roger Adams Laboratory; 217/244-3149 biocug@mcb.uiuc.edu), is available to answer questions of an academic or administrative nature. If you have questions of a scientific or professional nature, Mr. Goldberg will refer you to a faculty advisor. Students contact their faculty advisor (assigned during their sophomore year) direct for an appointment.

Note: Biochemistry Incoming Freshmen are advised by the staff in the MCB Advising Office, 127 Burrill Hall only during summer registration. When school starts contact the Biochemistry academic advisor, Jeff Goldberg, for questions or concerns.

Biochemistry deals with the chemical composition of living matter and the molecular nature of the processes of living systems. While cell and molecular biology, generally, has been greatly influenced by the rapid advances made in structural biology, biochemistry represents the core field that utilizes structural information for fully mechanistic, chemical interpretation. Its position at the interface between biology and chemistry places a substantial burden of fundamental knowledge on students with the desire to innovate in this field. The Biochemistry curriculum aims to provide a higher level of understanding of core chemical and physical principles, and to place these in a modern research context. The biochemist needs to learn the chemical structure of biological molecules and to define the chemical principles of biological functions. Questions that a biochemist might seek to answer include: What is the composition of cells? What chemical reactions go on inside cells and what are their functions? What is the chemical mechanism of inheritance, of growth, of cell division, of differentiation? How are the energy and material of food stuff converted to the material of new cells and energy of movement, heat, etc.? What chemical and physical properties of naturally occurring molecules enable them to carry out such highly specific functions? Biochemistry also encompasses the practical application of this fundamental knowledge about biological processes. Hence, biochemists are involved in the areas of medicine, pharmacology, agriculture, nutrition, microbiology, food technology, pollution control, and biotechnology.

Presently, a substantial portion of biochemists are employed as teachers and researchers in colleges and universities. Such positions usually require a doctoral degree and, frequently, post-doctoral research experience. Since biochemistry pervades nearly all areas of study in biology, biochemical education offers entry into diverse academic biological disciplines. Many
doctorate-level research biochemists are found in governmental research institutions, medical institutions, and many industrial research organizations. Industrial research is focused in the biotechnology, pharmaceutical, food processing, and fine chemicals areas. Many opportunities exist for biochemists with B.S. or M.S. degrees in all of these organizations. Executive, sales and technical personnel and other managerial workers in all the previously mentioned fields also often have their college training in biochemistry or chemistry.

**LINK TO FACULTY AND THEIR RESEARCH**

For a complete list of University of Illinois Biochemistry faculty and a description of their research please go to: [http://mcb.illinois.edu/departments/biochemistry/facultyalpha.html](http://mcb.illinois.edu/departments/biochemistry/facultyalpha.html).

The focus of the Biochemistry specialized curriculum is to provide training that is targeted towards students with research-oriented goals, including joint MD/PhD programs, as well as medicine. The Biochemistry major provides instruction in physic-chemical principles and in current developments in biochemistry, introduces undergraduates to the research literature, and requires a substantial research effort. Students who desire a general understanding of the role of biochemistry in biology and medicine are encouraged to explore the Molecular and Cellular Biology (MCB) major with an advising emphasis in biochemistry ([http://mcb.illinois.edu/undergrad/](http://mcb.illinois.edu/undergrad/)). To speak with an MCB advisor, contact the MCB Advising Office in 127 Burrill Hall, 217/333-6774.

Other links of special note are: College of Liberal Arts and Sciences (LAS): [http://www.las.illinois.edu/](http://www.las.illinois.edu/), The School of Molecular and Cellular Biology (SMCB): [https://mcb.illinois.edu/](https://mcb.illinois.edu/) and the Department of Biochemistry: [https://mcb.illinois.edu/departments/biochemistry/](https://mcb.illinois.edu/departments/biochemistry/).

**ADVISING**

Students who desire a general understanding of the role of biochemistry in biology and medicine are encouraged to explore the Molecular and Cellular Biology (MCB) major with an emphasis in biochemistry ([http://mcb.illinois.edu/about/](http://mcb.illinois.edu/about/)). Students who are interested in majoring in MCB instead of Biochemistry should meet with an academic advisor in the MCB Advising Office, 127 Burrill Hall, 407 S. Goodwin Ave., Urbana. Phone 217-333-6774 or email mcbadvising@life.illinois.edu to schedule an appointment.

A. Jeff Goldberg is the academic advisor for all Biochemistry students. Although biochemistry students may plan their schedules without consulting a Biochemistry advisor, self-advising is not recommended. Jeff is always available by appointment (email biocUG@mcb.uiuc.edu or phone 217/244-3149), and registration information is emailed to all biochemistry students before each registration period. Unless you consult
your advisor, you are solely responsible for your schedule and mistakes may result in delayed graduation.

B. Biochemistry Sophomore, Junior, and Senior students will be assigned a Biochemistry faculty advisor. This provides students with a unique opportunity to interact individually with a faculty member regarding advanced coursework, research, off-campus opportunities and post-graduation options. All students are strongly encouraged to meet with their faculty advisor at least once a semester but may find it necessary to see their advisor more frequently.

C. Honors Advising: Students wishing to discuss College honors opportunities/scholarships and to obtain information should schedule an appointment with the LAS Honors Dean (217-333-1158). Information on the honors programs available in the College of LAS can be found at: www.las.uiuc.edu/students/honors/.

D. DARSweb for Students: All students enrolled in the LAS College can access a Degree Audit Report (DARS, www.oar.uiuc.edu/current/dars/) to find requirements met or to be met. However, ultimate responsibility for the preparation of a sound program, both academically and procedurally, remains with the student. Students who have questions about their DARS Report should schedule an appointment to meet with Jeff Goldberg, 419A RAL or their records officer in 2002 Lincoln Hall.

E. LAS Admissions/Records Officers (AROs): Admissions records officers are responsible for preparing the graduation list and the final audit of students’ records for completion and certification of degree requirements. AROs are assigned groups of students based on the students’ last names. Students are encouraged to consult with their records officer once per semester, all of whom are available on a walk-in basis during regular office hours (http://www.las.illinois.edu/students/).

PROcedures for Changing Majors to Biochemistry

Students already at the University of Illinois and wishing to change their major to Biochemistry must be on track to meet the specialized curriculum requirements in a timely manner. An advising appointment and prior departmental approval is required for students to formally transfer into the Biochemistry curriculum. **Note:** a 2.75 GPA or higher (major GPA and on campus GPA) is required to change. Interested students should email biocUG@life.illinois.edu or phone 217/244-3149 to schedule an appointment.

The LAS College permits current UIUC students to change their majors during designated transfer periods. These can be found at: http://www.las.uiuc.edu/students/programs/declaring/.
An advising appointment and prior departmental approval is required before students can formally change into the Biochemistry major. Interested students should email biocUG@life.illinois.edu or call 217/244-3149 to schedule an appointment. Only students who are already on track to meet the requirements, and who meet the following conditions may be permitted to transfer into the Biochemistry curriculum:

**All students** must have completed at least one semester on campus with UIUC GPA average of 2.75 or higher and 2.75 GPA in all UIUC science and math courses (major GPA) and generally follow the 4 year plan to graduate on time (with a 5th year option). Also, written approval by Senior Coordinator of Student & Academic Affairs is required.

**Incoming Sophomores** must have completed Rhet 105, MCB 150, CALC I and General Chemistry sequence.

**Incoming Juniors** must have completed Rhet 105, MCB 150, 250, 251, 252, 253, CALC I, II, General Chemistry and Organic Chemistry sequences.

Note: Freshmen are defined as students who are admitted and enrolled for the first time as Freshmen at any collegiate institution (2-year or 4-year).

**Transferring out of Biochemistry:** Meeting with a biochemistry advisor is not required before transferring out of Biochemistry. Students must first see an advisor in the major of interest.

**BIOCHEMISTRY MAJOR PRE-REQUISITES**

**GENERAL CHEMISTRY PROFICIENCY AND PLACEMENT**
For most up to date cut off scores for AP credit please visit [http://cte.illinois.edu/testing/pnp/cutoff14/main14.html](http://cte.illinois.edu/testing/pnp/cutoff14/main14.html). No AP credit hours will be earned for lab hours.

All students planning to enroll in a general chemistry course must take *placement* exams in both chemistry and mathematics (ALEKS test). The results of these exams are used to place the student in the appropriate course. The results of the general chemistry exam are as follows:

*Placement into the introductory Chemistry courses* is based on a combination of the student’s highest ACT (or SAT) Math score and the student’s score on the UIUC Chemistry Placement Exam. Cutoff scores and placement recommendations are derived in collaboration with the Chemistry Department and are reviewed annually. The online Chemistry Placement Exam does not award proficiency credit. Questions should be directed to the Center for Teaching Excellence by emailing pnp@illinois.edu or by calling 244-4437.
Biochemistry Freshmen entering with placement scores for Chem 101 and 102 (and not Chem 202) should consider changing their major to Biology or Chemistry. You can talk to the advisor during summer registration about this possibility.

In addition, The Mathematics Department requires each student to take the ALEKS test to place in the appropriate Calculus or pre-calculus course.

BIOLOGY PLACEMENT
Biochemistry Freshmen who enter the University of Illinois without advanced placement credit for biology must enroll in MCB 150 (Molecular and Cellular Basis of Life) during their first year on campus. The lab, MCB 151, is not required. IB 150 (Organismal and Evolutionary Biology) and MCB 240 (Physiology) are optional.

NOTE: It is strongly recommended to enroll in MCB 150 regardless if you have AP credit. The classroom experience will be of great benefit for the ensuing MCB courses (250, 251, 252, 253, 354).

COURSE REQUIREMENTS FOR THE DEGREE
Students planning to major in biochemistry take an initial course program similar to the Chemistry and MCB major. Such beginning training assures adequate prerequisites to meet the advanced course work requirements of biochemistry.

The requirements, in addition to the campus General Education requirements, are: advanced general chemistry through Chemistry 205; advanced organic chemistry through Chemistry 436; calculus through 241; calculus based physics through Physics 214; one year of physical biochemistry (CHEM 440-B and BIOC 446); MCB core courses (MCB 150, 250/251, 252/253, and 354); Biochemistry core courses (BIOC 406, 455, 445, and 460); 10 hours of Advanced Technical Electives which can include up to 7 hours of BIOC 492 (senior year research).

See Appendix I for Biochemistry Curriculum worksheet.

Appendix II (Sample Schedule) lists the sequence of courses by semester that lead to the degree in Biochemistry. A 2.00 (“C”) overall grade-point average as well as a 2.5 GPA in science and math courses is required for graduation in Biochemistry. Careful planning using the Sample Schedule along with the use of the Curriculum worksheet (Appendix I) and DARS report (see page 15) is essential to successful negotiation of the sequential interrelated requirements for the Biochemistry degree. Students are strongly encouraged to use the worksheets and regularly meet with their advisor and records officer to ensure on-time graduation.
**Note 1:** Substitutions for required courses must be approved by your advisor and the department before registration in the substituted course, and an approved request form from the advisor must be placed in your departmental file.

**Note 2:** The credit/no credit option may not be used for any course, or its prerequisite course(s), that is taken to fulfill a specific course requirement in the biochemistry curriculum or any general education requirements.

A. **The Chemistry Requirement (General, Organic, Physical):**

   **General Chemistry:** The accelerated Chemistry sequence, CHEM 202/203 and 204/205, is required because it will give students a stronger background, especially in laboratory skills.

   **Organic Chemistry:** The preferred two-semester sequence is Chemistry 236/237 and 436.

   **Physical Chemistry:** The preferred two-semester sequence is Chemistry/Biochemistry 440-B and Biochemistry 446. BIOC/CHEM 440-B (fall only) and BIOC 446 (spring only) are designed to be a one-year sequence in Physical Biochemistry.

B. **The Mathematics Requirement:** Completion of the 3-semester calculus sequence is required for all Biochemistry students. MATH 220 or 221, 231, and 241.

C. **The Physics Requirement:** The calculus-based sequence, Physics 211, 212, 213, 214, is strongly preferred. On rare occasions, students with insufficient backgrounds in mathematics may substitute the non-calc based Physics 101/102 sequence with advisor approval.

   _Advising Note:_ The appropriate substitution sequence is Physics 101 = Physics 211 & 213 and Physics 102 = Physics 212 and 214.

D. **The Molecular and Cellular Biology Requirement:** MCB 150, MCB 250/251, MCB 252/253, and MCB 354 are required for all Biochemistry majors. **Note:** BIOC/MCB 450 does not satisfy the degree requirements. The MCB core sequences serves as the prerequisite for most 400-level MCB courses. Students should begin in the spring semester of their freshmen year with MCB 150 and continue in the following fall with MCB 250/251 and MCB 252/253 in the spring of the sophomore year. These courses are offered fall, spring, and possibly summer.

   Biochemistry majors who are contemplating transfer to the Molecular and Cellular Biology major should also consider taking IB 150.
The intent of the MCB requirements is to expose the student to material different from that covered in biochemistry courses in order that students gain an appreciation of the biological aspects of biochemistry and forms the background for biochemistry courses. **Note:** MCB 250/251/252 is the prerequisite for MCB 354 (gateway course).

E. **The Biochemistry Requirement:**

**BIOC 190 – BIOCHEMISTRY FRESHMEN ORIENTATION AND SEMINAR** - Lectures designed to acquaint the biochemistry major with the various specializations available in the field, career exploration procedures, and a wide range of opportunities of special interest to biochemistry students.

**BIOC/MCB 406 – Gene Expression-RNA (3 hours):** This course is designed to follow MCB 354 and is an introduction to gene expression and how different segments of gene expression pathways including gene transcription, RNA processing, protein translation, targeting, activity and turnover are modulated to maintain cellular homeostasis. The technologies (both general and specialized) used currently to analyze gene expression and the regulation of protein function is also discussed.

**BIOC 455 – Techniques in Biochemistry and Biotechnology (4 hours):** Introduction to modern methods of biochemical experimentation. Lectures and labs on the theory and practices underlying various methods and instrumentation including protein purification and quantitative analyses, immunoassays, enzymology, protein and DNA sequencing, DNA arrays, Mass spectroscopy, and bioinformatics.

**BIOC 460 – Biochemistry Senior Seminar (3 hours):** This course fulfills the campus Advanced Composition requirement, and is designed to be taken in the fall semester of the senior year. It is also an advanced course that specifically introduces undergraduates to the primary research literature and requires written analyses of current research. Instruction will be given on the writing of scientific papers, and this will also serve as a guide for the students’ own senior theses. All written work will be reviewed, critiqued, and re-written. This course addresses the American Society for Biochemistry and Molecular Biology (ASBMB) recommendation to train students in the “ability to assess primary papers critically.”

**BIOC 445 – Current Topics in Biochemistry (3 hours):** This is a “capstone” course and is designed to be taken in the spring semester of the senior year. Selected areas of current research activity will be covered, presented by a faculty member. The course will be presented in lecture format, but based on readings from the primary literature (students will have already gained experience with the primary literature in BIOC 460, the previous semester). Students in the capstone course will present research from selected journal articles, and an important goal of the lectures will be to bring the students to a level of understanding sufficient for them to follow these research seminars with ease.
F. **The Advanced Technical Elective Requirement:** Biochemistry majors are required to complete 10 credit hours of Advanced courses from an approved list. See Appendix III for a list of approved advanced courses. The ability to take courses outside MCB/Biochemistry is in accord with the ASBMB recommendations for students to take advanced offerings, broadly, in science and engineering. **BIOC 492 – Senior Thesis Research (maximum 10 hours over two or three semesters):** Based on a recent report commissioned by the National Institutes of Health and the Howard Hughes Medical Institute, the American Society for Biochemistry and Molecular Biology (ASBMB) has strongly recommended that two semesters of genuine research experience be incorporated into Biochemistry curricula. This has been adopted as a *strongly recommended* element of the biochemistry curriculum. **NOTE:** Although a student is allowed to register for up to 10 hours of BIOC 492, only 7 credit hours may count towards the 10 hours of Advanced Technical Electives (6 credit hours are needed for Department Distinction).

G. **The General Education Requirement:** Students in the Biochemistry Curriculum are required to satisfy the Campus General Education requirements and must complete a minimum of 6 hours each in the Social and Behavioral Sciences, the Humanities and the Arts, and Cultural Studies: both non-Western/US Minority Culture(s) and Western/Comparative Culture(s). The total GenEd requirement is 18 hours. **Your physical science gen eds will be fulfilled from courses within your major.**

Students must use the *General Education Requirements Course Lists*, which can be found on the UIUC website https://courses.illinois.edu/gened/DEFAULT/DEFAULT to satisfy these requirements:

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<th>Requirement</th>
<th>2 courses:</th>
<th>1 course:</th>
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<td><strong>Humanities and the Arts</strong></td>
<td>Literature and the Arts or Historical and Philosophical Perspectives</td>
<td>Non-Western/US Minority Culture(s) or U.S. Minority Culture(s)</td>
</tr>
<tr>
<td>6 hours (minimum)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Social/Behavioral Sciences</strong></td>
<td>Social Sciences or Behavioral Sciences</td>
<td></td>
</tr>
<tr>
<td>6 hours (minimum)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Cultural Studies</strong></td>
<td>Non-Western/US Minority Culture(s) or U.S. Minority Culture(s)</td>
<td>Western/Comparative Culture(s)</td>
</tr>
<tr>
<td>6 hours (minimum)</td>
<td></td>
<td></td>
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</tbody>
</table>

**Note:** Students may elect 1 course in each subcategory (e.g., 1 Social Sciences – 3 hrs and 1 Behavioral Sciences – 3 hrs) or may elect 2 courses in the same category (e.g., 2 Social Sciences courses – 6 hrs).
It is the student’s responsibility to check these lists for the current available courses. Your records officer in the LAS College Office can help you with this (2002 Lincoln Hall).

H. **The Cultural Studies Requirement:** All students must satisfy this campus requirement (see above). The requirement consists of one course in either Non-Western or U.S. Minority Culture(s) and one course in Western/Comparative Culture(s).

*Advising Tip: You can satisfy two General Education requirements with one course if you choose carefully.* Some courses approved for Cultural Studies also appear on the Humanities/Arts and Social/Behavioral Sciences lists (see above). These courses, if taken, will satisfy both requirements. A course cannot satisfy both the western cultures and non-western cultures gen eds.

I. **The Foreign Language Requirement:** Biochemistry students in the specialized curriculum are required to complete through the third level of a foreign language at the University. Students who have satisfactorily completed at least three years of a single foreign language in high school are not required to take foreign language courses at the University (1 year of high school equals 1 level of college).

J. **The English Composition Requirement:** All students in the College of LAS are required to complete:

*Composition I:* Credit is allowed for one of the following: Rhetoric 105, or Speech Communications 111 and 112, or English as a Second Language 114 and 115, etc. This requirement must be completed during the freshman year. It is possible to receive AP credit for Composition I.

*Advanced Composition (Comp II):* This requirement cannot be met by passing a proficiency examination. **BIOC 460 will satisfy this requirement for biochemistry students.**

Courses taken to fulfill the requirements of another degree (e.g., dentistry, etc.), whether at the University of Illinois or at another University, may NOT be used to fulfill any of the degree requirements. This does not apply, however, to LAS approved double-degree students in Biochemistry (see below).

**MINORS**

Chemistry is automatically added as a minor once you complete the biochemistry curriculum. Other Minors that seem to fit well with the biochemistry major are: Bioengineering, Physics and Business, although feel free to find one of special interest to you.
UNDERGRADUATE RESEARCH OPPORTUNITIES

BIOC 290 – LABORATORY PROJECTS
BIOC 290 is highly recommended and intended to provide an opportunity for undergraduate students prior to senior year to receive academic credit for supervised laboratory research projects conducted under the direction of a Biochemistry or MCB faculty member. Biochemistry majors who wish to enroll for BIOC 290 credit with Biochemistry or MCB faculty must submit the BIOC 290 Learning Agreement form to Room 419A RAL. **NOTE:** these procedures are for Biochemistry majors only. MCB majors use different forms and procedures for MCB 290 and submit their forms to MCB Office in Room 252 Davenport Hall.

Biochemistry students desiring to enroll in BIOC 290 must first identify a Biochemistry or MCB faculty supervisor. For information on faculty research interests, students should refer to the Biochemistry website (http://mcb.illinois.edu/departments/biochemistry/, click faculty). **NOTE:** 290 projects must be biochemical in nature. The faculty member and student must then prepare and sign a detailed written BIOC 290 Learning Agreement form in which the learning outcomes, specific activities, and expectations of the student are delineated and the means of evaluation and credit to be awarded (1-5 credit hours per semester) are specified. Biochemistry major students cannot enroll in BIOC 290 without first presenting a completed and signed 290 Learning Agreement form to room 419A RAL. This agreement must then be reviewed and approved by the Department. Students who have received departmental enrollment approval will be given the instructor’s CRN in order to officially register for the course. **NOTE:** a rule of thumb is 1 credit hour equals 5 man-hours per week.

Interested students should stop by the Biochemistry Student & Academic Affairs office (419 RAL) to pick up a copy of the BIOC 290 form or download a copy from the biochemistry website at www.mcb.uiuc.edu/departments/biochemistry/290.html. **NOTE:** Up to 10 hours of BIOC 290 credit can count towards 120 hours to graduate and the overall GPA. None of the BIOC 290 credit counts in the major GPA.

BIOC 492 – SENIOR THESIS RESEARCH

A critical component of the specialized Biochemistry curriculum is the meaningful research experience. Registration in BIOC 492 during the senior year is strongly recommended. Biochemistry 492 provides an excellent opportunity for Biochemistry students to work in a research laboratory during their senior year. The experience is valuable, especially for those students considering professional or post-graduate education. Admissions committees of both graduate and professional schools look with favor on students with research experience. Senior
research may also help the student procure a letter of recommendation from the research advisor.

Prerequisites for 492 require the prior completion of the Biochemistry core courses (MCB 354, BIOC/MCB 406, and BIOC 455) before enrollment in BIOC 492. Prior enrollment in BIOC/MCB 290 is strongly recommended. Each February, information is mailed to all Junior Biochemistry majors. Students are asked to schedule interviews with Biochemistry faculty, with whom they might like to work, to discuss possible projects. NOTE: Normally students may not simultaneously hold a Teaching Assistantship while enrolled in BIOC 492 due to time constraints.

Second semester Juniors, after they are accepted into a laboratory, will be able to register for 1-6 hours of BIOC 492 for the following Summer, Fall and Spring semesters. Students must complete at least 6 hours of BIOC 492 over a minimum of two semesters and present a thesis for deposit in the Department of Biochemistry (with a copy for the College Office) in order to receive a grade in this course and to be considered for graduation with distinction. The grade in BIOC 492 will be based upon performance in the laboratory and quality of the thesis, which must be submitted to the thesis advisor in March for May graduates. The grade at the end of the summer/fall semester(s) will be deferred (“DFR”), although the thesis advisor will evaluate the student and provide feedback at that time.

Interested students should stop by the Biochemistry Student Academic Affairs office (419 RAL) to pick up a copy of the BIOC 492 form or download a copy from the biochemistry website at www.mcb.uiuc.edu/departments/biochemistry/492.html. NOTE: Up to 10 hours of BIOC 492 credit can count towards 120 hours to graduate and the overall GPA. None of the BIOC 492 credit counts in the major GPA. You can use up to 7 hours of BIOC 492 towards the 10 hours of Advanced Technical electives requirement. NOTE: You do not need to fill out a BIOC 492 form if you are using the same lab as BIOC 290.

**SUMMER RESEARCH SCHOLARSHIPS:**

**Any Underclassman: Jackson Summer Scholar Award** in Biochemistry. This monetary award provides, in part, the summer stipend for a junior Biochemistry student that will begin working on a Biochemistry 492 research project in a Biochemistry faculty laboratory in the summer before their senior year. Nominations require a recommendation letter from the research advisor describing the 492 project and the student’s qualifications. A BIOC 492 Student Information Form and the student’s CV/resume must have already been submitted.

**Junior Award: Biochemistry Summer Scholarship** Award in Biochemistry. This monetary award provides, in part, the summer stipend for a junior Biochemistry student that will begin working on a Biochemistry 492 research project in a Biochemistry faculty laboratory in the summer before their senior year. Nominations require a recommendation letter from the
research advisor describing the 492 project and the student’s qualifications. A BIOC 492 (or 290) Student Information Form and the student’s CV/resume must have already been submitted.

Nomination letters, Student Information Form and the student’s CV/resume must be submitted in March.

**DEPARTMENTAL DISTINCTION:**
In order to qualify for graduation with distinction, students must 1) be registered for at least 6 hours of BIOC 492, 2) complete a senior thesis, and 3) be recommended for distinction by their thesis advisor. To be eligible, a student must have an overall grade-point average of at least 3.25 (effective at the end of the fall semester of the senior year) and must register in the senior thesis course Biochemistry 492. Recommendations for distinction are based on the quality of the thesis work and academic GPA. It is important that the thesis advisor comment on whether the results presented in the thesis are the sole work of the 492 student or if some experiments are a result of collaborative efforts. This should also be made clear in the thesis.

**Highest Distinction** - GPA at least 3.75 (student interview required).
**High Distinction** - GPA at least 3.50 (student interview required)
**Distinction** - GPA at least 3.25
The decision of whether or not the thesis warrants Departmental Distinction will be made by the thesis advisor and the Departmental Awards Committee. In general, about half of the theses in any year have warranted some form of Departmental Distinction. **Nomination deadline is in March.**

Interviews: following review by the Biochemistry Awards Committee, students nominated for High/Highest Distinction will be interviewed.

b. **Awards:** two Senior Thesis Awards are available to exceptional BIOC 492 senior thesis students who graduate in May. The winners’ achievements are recognized at the MCB Awards Ceremony in May (Reading Day). Students must be nominated by their BIOC 492 thesis advisor. **The nomination deadline is in March.**

i. **William T. and Lynn Jackson Senior Thesis Award:** This award was established in 2004 and is given at the end of each Spring semester to the senior student who presents the best Biochemistry senior thesis. The award is sponsored by Dr. William Jackson, a Chemistry graduate of the University of Illinois. The award is a cash prize.

ii. **Thomas O. Sidebottom Award:** This award was established in 1986 and is given at the end of each Spring semester to the senior student who presents an outstanding Biochemistry senior thesis. The award is sponsored by Thomas Sidebottom, a Biochemistry graduate of the University of Illinois. The award is a cash prize.

**STUDY ABROAD**
The Biochemistry Department and the School of Molecular and Cellular Biology have developed a study abroad exchange program with Stockholm University and fulfill Biochemistry core requirements. The best time to enroll is Spring of your Junior year. This allows for the most flexibility and least amount of course movement to study abroad. If you think you might be interested contact Jeff Goldberg in 419A RAL early (preferably spring of your freshman year).

There are other non-academic year opportunities whereby the Biochemistry Department recommends to its students to participate in Study Abroad. These courses count as electives or General Education credit and do not satisfy specific science requirements in the curriculum. Summers and winter breaks are opportunities. All Study Abroad courses approved for transfer by the College of LAS will count toward the 120 hour degree requirement, normally as elective credit. Students interested in pursuing this opportunity should contact the Study Abroad Office (115 International Studies Bldg., 190 S. Fifth Street; website: www.studyabroad.uiuc.edu/).

DEGREE OPTIONS

Students in the Biochemistry Specialized Curriculum receive the Bachelor of Science degree. Although LAS students can take one degree in the Specialized Curriculum of Biochemistry and a second degree in any Science and Letters Field of Concentration in LAS, this is not recommended for Biochemistry majors due to the intensity of the major. LAS students may receive a double degree if they meet the requirements of both majors and complete 30 additional hours in the second major (150 total hours instead of 120 hours). (www.admin.uiuc.edu/policy/code/) Exception: Students earning a degree in Molecular and Cellular Biology may not also earn a second degree in the Specialized Curriculum in Biochemistry.

Because Biochemistry is a Specialized Curriculum, double majors are not allowed by the College of Liberal Arts and Sciences. Double (2nd) degrees may be allowed (see above), but only with departmental and college level approval.

SUB-SPECIALTY (Professional) CODES: If you are considering one of the health professions, social work or veterinary medicine, you may indicate a specific interest in one of the following sub-specialties. You may use only one code, and are not committed to pursue a career in that profession; the code will simply place your name on an informational mailing list. If you are interested in one of them, you should so inform your LAS records officer in room 2002 Lincoln Hall.

PD – preDentistry PM – PreMedicine PP – prePhysical Therapy
PJ – preJournalism PN – preNursing PX – prePharmacy
PL – prelaw PO – preOccupational Therapy PV – preVeterinary Medicine

For additional information, contact the Career Center at http://www.careercenter.illinois.edu.
TRANSFER STUDENTS FROM OTHER COLLEGES/UNIVERSITIES

Students who attend a two-year community college or other college with the intent of transferring to the Department of Biochemistry at the University of Illinois, should consider in detail the requirements for the degree and how best to prepare for studies in Urbana. A suggested two-year program coinciding with the 4 year sample schedule in appendix II should prepare the student for transfer to the University of Illinois. Students interested in transferring into the Biochemistry curriculum should contact Jeff Goldberg (biocug@mcb.illinois.edu) for advising. For assistance with the transfer process, students should contact the LAS College office.

Students contemplating transfer into the Biochemistry Curriculum should be aware of several points:

1. Students wishing to transfer must already be on track to have a schedule that can meet the specialized curriculum requirements in a timely manner.
2. A good background in qualitative and quantitative chemical analysis is very important.
3. A strong background in mathematics is required to understand the necessary concepts of physics and physical chemistry.
4. Virtually all transfer students need 6 semesters to complete the biochemistry degree. This is due to our MCB sequence which generally starts in the sophomore year (after MCB 150 – see 4 year plan appendix) and because the courses are not offered elsewhere.
5. Transfer students must earn at least 60 hours (including 21 advanced hours) for graduation from the University of Illinois at Urbana.

TRANSFER CREDIT
Biochemistry majors who are contemplating taking summer session courses at other institutions must first check the Illinois Course Equivalency Guide at https://www.transferology.com to verify that the course has been approved for transfer and is equivalent to the desired UIUC course. Regardless of the website information, students must see their records officer, room 2002 Lincoln Hall, for information concerning transfer of course credit to UIUC from other schools and to receive degree approval. Departmental approval prior to enrollment in the course(s) is required.

CREDIT/NO CREDIT REGISTRATION
Choosing this option enables students to register in elective courses outside the Biochemistry major. The credit/no credit option may not be used for any course, or its prerequisite course(s), that is taken to fulfill a specific course requirement in the biochemistry curriculum or general education courses. Students wishing to select this option must complete a Credit/No Credit
POST-GRADUATION OPTIONS

Most biochemistry graduates gain employment in industry or government, or enter medical school or graduate school. The information below outlines how to investigate these possibilities.

A. Job Opportunities

1. **The UIUC Career:** Website: [www.careercenter.illinois.edu](http://www.careercenter.illinois.edu)
The University maintains a **Career Services Center**, located at 715 S. Wright Street (217-333-0820), right across from the Alma Mater, which offers a full range of programs, services, resources, and counseling to assist current students with career guidance, exploration, and job-search strategies. The Center also provides graduate and professional school information and supports a paraprofessional program. Online guide to finding an Internship: [www.careercenter.illinois.edu/about/employment/internships](http://www.careercenter.illinois.edu/about/employment/internships).

2. **Biological Sciences:** Internship Website: [mcb.illinois.edu/undergrad/advising/resources](http://mcb.illinois.edu/undergrad/advising/resources)
The MCB Advising Office maintains a Career Services and Resources Room, located in room 127 Burrill Hall (217-333-6774) that provides information about biologically-related careers. Brochures, pamphlets, and books about specific biological careers are available, as well as information on corporations, government employment opportunities, and graduate programs.

3. **Biotechnology Center:** Website: [http://www.biotech.uiuc.edu/](http://www.biotech.uiuc.edu/)
The Biotechnology Center maintains a **Placement Office**, room 108 Observatory (901 S. Mathews; Phone: 217-333-1378) which provides a central location for companies seeking candidates for positions in biologically related areas.

4. **Biochemistry:** The **Biochemistry Office of Student Academic Affairs** maintains a “Job Opportunities” bulletin board which contains job announcements received by Biochemistry faculty, located in room 420 Roger Adams Laboratory.

B. **Medical School:** Website: [www.careercenter.illinois.edu](http://www.careercenter.illinois.edu)
The University maintains an active *Health Professionals* counseling center as part of the UIUC Career Center, located at 715 S. Wright Street, right across from the Alma Mater. Call 217-333-7079 for an appointment. This office performs such services as: planning academic programs to meet entrance requirements, obtaining letters of evaluation, arranging meetings with representatives of various schools, etc.  
www.careercenter.illinois.edu/health%20professions  
US Medical School M.D./Ph.D. Programs:  
www.careercenter.illinois.edu/students/grad-school

C. **Graduate School:** Websites:  [www.gradschools.com](http://www.gradschools.com) or [www.petersons.com](http://www.petersons.com)  
Preparing for Graduate School:  www.careercenter.illinois.edu/students/grad-school  
Each fall, all Junior and Senior Biochemistry majors are invited to a discussion meeting with one or two of the faculty to discuss the general topic of graduate schools. Information regarding graduate programs may be found in “Peterson’s Annual Guides to Graduate Study” which is on reserve in the Chemistry Library. Another source of information is the Department of Biochemistry faculty. The educational background of each staff member through a link [http://mcb.illinois.edu/faculty/biochemistry](http://mcb.illinois.edu/faculty/biochemistry). If you are interested in attending a school that was attended by one of the faculty, feel free to make an appointment to discuss that school’s program with the faculty member.

**APPENDIX**

**APPENDIX I: BIOCHEMISTRY CURRICULUM SHEET**

**APPENDIX II: SAMPLE FOUR YEAR SCHEDULE**

**APPENDIX III: LIST OF APPROVED ADVANCED COURSES**
I. BIOCHEMISTRY CURRICULUM WORKSHEET

Revised for Fall 2015

**FOUNDATION**

A. CHEMISTRY ......................................................... 19 HOURS
   1. General: 202 (3), 203 (2), 204 (3), and 205 (2)
   2. Organic: 236 (4), 237 (2), and 436 (3)

B. MATHEMATICS (Calc I, II, III) ................................ 11 HOURS
   221 or 220 (4-5), 231 (3), and 241 (4)

C. Molecular & Cellular Biology ................................. 17 HOURS
   MCB 150 (4), MCB 250 and 251 (5), MCB 252 and 253 (5), and MCB 354 (3)

D. PHYSICS ........................................................... 12 HOURS
   211 (4), 212 (4), 213 (2), and 214 (2)

**CORE**

E. Physical (Bio)Chemistry: CHEM 440-B (4) and BIOC 446 (3) .........................7 HOURS

F. BIOCHEMISTRY ..................................................... 14 HOURS
   BIOC 199 for freshman (1), MCB/BIOC 406 (3), BIOC 455 (4), BIOC 460 (3), BIOC 445: Capstone (3)

G. ADVANCED TECHNICAL ELECTIVES (see Department list)........... MINIMUM 10 HOURS
   Can use up to 7 hours of senior research (BIOC 492*)

   **Total hours in major: 90**

   *Senior Research (BIOC 492) is strongly recommended and can use up to 10 hours towards 120 hours to graduate.
   [BIOC 290, precursor for BIOC 492, is strongly recommended]

**Campus Requirements**

H. COMPOSITION I ................................................. 4 HOURS

I. FOREIGN LANGUAGE (3rd level College or 3 years High School) ........... 0-12 HOURS

J. ADVANCED COMPOSITION - BIOC 460 (3) [required, embedded in Major] .. 3 HOURS

K. CULTURAL STUDIES ............................................. MINIMUM 6 HOURS
   1. Non-Western/U.S. Minority (3 Hours)  2. Western/Comparative (3 Hours)

L. GENERAL EDUCATION (Double dipping allowed with Cultural Studies) .. MINIMUM 12 HOURS
   1. Social/Behavioral Sciences (6 Hours) 2. Humanities/Arts (6 Hours) 3. Science (embedded in Major)

M. ELECTIVES/MINOR(S) - STUDY ABROAD
II. BIOCHEMISTRY 4 YEAR PLAN
Revised for Fall 2015

<table>
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<tr>
<th>FRESHMAN</th>
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<th>Spring Semester</th>
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<tr>
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<td>Hrs.</td>
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<tr>
<td>Chem 202&amp;203</td>
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<td>Fall Only</td>
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<tr>
<td>Math 220</td>
<td>5</td>
<td>all</td>
</tr>
<tr>
<td>Rhet 105 (or SP)</td>
<td>4</td>
<td>all</td>
</tr>
<tr>
<td>Bioc 199</td>
<td>1</td>
<td>Fall only</td>
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<tr>
<td>LAS 101</td>
<td>1</td>
<td>Fall only</td>
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<tr>
<td>Gen eds/Lang</td>
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<td>Hrs.</td>
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<tr>
<td>Chem 236&amp;237</td>
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<tr>
<td>MCB 250&amp;251</td>
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<td>all</td>
</tr>
<tr>
<td>Math 231</td>
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<td>all</td>
</tr>
<tr>
<td>Lang or Gen ed</td>
<td>3-4</td>
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<td>Hrs.</td>
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<tr>
<td>MCB 354gateway</td>
<td>3</td>
<td>Fall, Spring</td>
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<tr>
<td>Physics 212</td>
<td>4</td>
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<tr>
<td>BIOC 290*</td>
<td>1-5</td>
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<tr>
<td>Gen ed/Elective</td>
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<tr>
<td>BIOC 492*</td>
<td>3-5</td>
<td>all</td>
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<tr>
<td>Gen ed/Elective</td>
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<tbody>
<tr>
<td>Course</td>
<td>Hrs.</td>
<td>Offered(+)</td>
</tr>
<tr>
<td>BIOC 440-B</td>
<td>4</td>
<td>Fall Only</td>
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<tr>
<td>BIOC 460</td>
<td>3</td>
<td>Fall Only</td>
</tr>
<tr>
<td>BIOC 492*</td>
<td>3-5</td>
<td>all</td>
</tr>
<tr>
<td>Advanced.Tech</td>
<td>3</td>
<td>various</td>
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*Can use up to 7 hours of senior research (BIOC 492) towards 10 hours of advanced technical electives. Senior Research (BIOC 492) is highly recommended and can use up to 10 hours towards 120 hours to graduate. [BIOC 290, precursor for BIOC 492, is strongly recommended]

**Distinction:** To be considered for graduation with distinction, a student must earn a minimum GPA of 3.25, be enrolled for at least 6 hours of senior research (BIOC 492) and submit a thesis for approval by the Biochemistry Awards Committee.

### III. LIST OF APPROVED ADVANCED COURSES

**Excluded courses:**
- MCB 436 – Global Biosecurity 1 credit hr. –
- MCB 434 Food & Industrial Microbiology (FSHN 471)

**Approved MCB/BIOC Courses**
- MCB 300 Microbiology
- MCB 301 Experimental Microbiology
- **MCB 314** Introduction to Neurobiology (NEUR 314)
- MCB 316 Genetics and Disease
- MCB 320 Mechanisms of Human Disease
- MCB 400 Cancer Cell Biology
- MCB 401 Cell and Membrane Physiology
- MCB 402 Systems and Integrative Physiology
- MCB 403 Cell and Membrane Physiology Laboratory
- MCB 404 Systems and Integrative Physiology Laboratory
- MCB 408 Immunology
- MCB 410 Developmental Biology
- MCB 413 Endocrinology
- **MCB 419** Brain, Behavior & Info Process (BIOP 419, NEUR 419)
- MCB 421 Microbial Genetics
- MCB 424 Microbial Biochemistry
- MCB 426 Bacterial Pathogenesis
- MCB 428 Bacterial Pathogens Laboratory
- MCB 431 Microbial Physiology
- MCB 432 Computing in Molecular Biology
- MCB 433 Virology & Viral Pathogenesis (PATH 433)
- MCB 435 Microbial Ecology and Evolution
- MCB 442 Comparative Immunobiology (ANSC 450, PATH 410)
- **MCB 461** Cellular & Molecular Neuroscience (NEUR 461)
- **MCB 462** Integrative Neuroscience (NEUR 462)
- **MCB 481** Developmental Neurobiology (NEUR 481)
- MCB 508 Intro to systems Neuroscience (PSYC 508)
- BIOC 492 Senior Thesis (no more than 6 hours)

**Non-MCB Courses**
- BIOE 461 Cellular Biomechanics (TAM 461)
BIOP 401 Introduction to Biophysics
BIOP 432 Photosynthesis (IB 421, CPSC 489)
CB 467 Fundamental Pharm Disc & Devel
CHBE 471 Biochemical Engineering
CHBE 472 Techniques in Biomolecular Engr.
CHBE 473 Biomolecular Engineering
CHEM 312 Inorganic Chemistry
CHEM 438 Advanced Organic Chemistry
CHEM 480 Polymer Chemistry (MSE 457)
CHEM 482 Polymer Physical Chemistry (MSE 458)
CHEM 534 Advanced Organic Synthesis
CS 466 Introduction to Bioinformatics
IB 302 Evolution
IB 360 Evolution and Human Health (ANTH 360)
IB 361 Ecology and Human Health (ANTH 361)
IB 364 Bioinformatics and the Human Genome
IB 402 Molecular Evolution
IB 420 Plant Physiology (CPSC 484)
IB 424 Plant Development
IB 426 Env. and Evol. Physl. of Animals
IB 445 Chemical Ecology
IB 485 Environmental Toxicology & Health (CHLH 461, ENVS 431)
IB 487 Math Modeling in Life Sciences (ANSC 448, STAT 458)
MATH 415 Applied Linear Algebra
MATH 453 Elementary Theory of Numbers
PHYS 404 Electronic Circuits
PHYS 420 Space Time & Matter (PHIL 420)
PSYC 403 Memory and Amnesia (NEUR 403)
PSYC 413 Psychopharmacology (NEUR 413)
STAT 400 Statistics & Probability I (MATH 463)
STAT 420 Method of Applied Statistics
STAT 430 Topics of Applied Statistic (check sections)
STAT 551 Theory of Probability I (MATH 561)
IV. FINDING STUDENT INTERNSHIPS

Undergraduate internship opportunities and summer research programs are offered by:
- State and federal government agencies
- Private industry
- Nonprofit organizations
- Academic institutions (colleges and universities)

**Begin with the UI Career Center** ([www.careercenter.illinois.edu](http://www.careercenter.illinois.edu)) to gain a basic understanding of the internship experience and how to make the most of it. Here you'll find:

- **Search instructions** and
- **Job/internship databases** to help you think about your goals and aid your search for experiential education.

In particular, The Career Center recommends use of the I-link system ([www.careercenter.illinois.edu/rc/databases/ilink.php](http://www.careercenter.illinois.edu/rc/databases/ilink.php)) to explore your opportunities, as well as their
- **Career Center workshops** and their
- **One-on-one advising** to assist you in finding a program that's a good fit for you.

**Check out pre-filtered opportunities for students in the Biological/Biochemistry Sciences:**

- **WebGURU** ([www.webguru.neu.edu](http://www.webguru.neu.edu)) The Web Guide to Research for Undergraduates offers a Program Listing of summer research opportunities.

**Look at Federal Student Internships:** The federal agencies and departments offer many student internships:

- **Watch the Career Center for federal internship events:**
  - Sign up for the [Career Connections newsletter](http://www.Careercenter.illinois.edu/services/newsletter)
  - Meet with Tori Tanney Spring, Assist Dir. Employer Connections and Job Preparation, to talk about your interests (v.spring@illinois.edu; 333-0820)
  - View the webinar hosted by the Partnership for Public Service- PCs only: Federal Internships: Find and Apply for Summer 2011 (recorded on Oct. 20,2010):
    - [http://ourpublicservice.org/OPS/dropbox/livemeeting.wmv](http://ourpublicservice.org/OPS/dropbox/livemeeting.wmv)

- **Get into the Federal Internship loop** by subscribing to: "Hot Jobs and Cool Internships" e-news from the Partnership for Public Service ([http://ourpublicservice.org/about-us/internship-program.php](http://ourpublicservice.org/about-us/internship-program.php)).

- Download the [MCB Federal Internship Workshop (pdf) handout](http://mcb.illinois.edu/undergrad/advising) for a description of steps you can take to find a federal internship with a focus on the Biological/Biochemistry Sciences.
Search for Industry Internships: While it would not be possible to provide a comprehensive list of student internships offered at companies, below is a list of several companies in or near Illinois that often do:

- Abbott Laboratories (www.abbott.com)
- Pfizer Pharmaceuticals (www.pfizerrdgrad.com/home.php?id=internship)
- Sigma-Aldrich Co. (www.sigmaaldrich.com/site-level/career-opportunities/coop-program.html)
- Monsanto Corp. (www.monsanto.com/careers/getting_started/students.asp)
- Thermo Fisher Scientific (www.piercenet.com/)
- Archer Daniels Midland Co. (www.adm.com/)
- Pioneer (www.pioneer.com/web/site/portal/)

For a partial listing of IL biotechnology companies: www.thelabrat.com/jobs/companies/BiotechIllinois.shtml

Consider Non-Profit Internships: www.idealist.org/ and www.internships.com

And watch roadMAP, the MCB/Biochemistry e-newsletter (subscribe: http://mailman.illinois.edu/mailman/listinfo/map)

FAQs about finding internships and summer research programs:

1. When should I look into an internship or summer research position? It is not too early to begin exploring internships as a freshman – some programs will consider the applications of first year undergraduates. However, internships and summer research programs are typically targeted to the summers following the sophomore and junior years.

2. Where do I begin in a search for internships or research? Take advantage of workshops offered during the fall semester by The Career Center and MCB Advising program. This is the best time to gather information as application deadlines often occur in late January or early February. While the MCB/Biochemistry Advising Program will advertise via our e-mails and roadMAP, information for a few specific internships and summer research programs of which we become aware, your best approach to finding opportunities will be to take advantage of the search strategies described above.

3. How do I find out if a particular company offers internships? Search the company website with search terms such as "student" and "internship". If you find none, don't hesitate to contact the company to inquire.

4. Who writes my letters of recommendation? Some programs will stipulate the source(s) of letters - E.g. professors and/or academic advisors. Keep in mind that, since most application deadlines coincide with the busy start of the spring semester, you should request your letters of support at the end of the fall semester or over winter break. Plan to provide your writers with a minimum of two weeks to submit a letter.