DNS ADVISING NOTES:
Core Biology and Chemistry Courses

INTRODUCTORY CHEMISTRY
- CHEM 2070-2080 (8 cr) Fall-Spring

ORGANIC CHEMISTRY LECTURE
Choose from:
- CHEM 1570 (3 cr) Spring
- CHEM 3530 (3 cr) Fall
- CHEM 3570-3580 (6 cr) Fall-Spring
- CHEM 3590-3600 (8 cr) Fall-Spring

ORGANIC CHEMISTRY LAB
Choose from:
- CHEM 2510 (2 cr) Fall or Spring
- CHEM 3010 (4 cr) Spring

BIOCHEMISTRY
Choose from:
- NS 3200 (4 cr) Fall
- BIOMG 3300 (4 cr) Fall or Spring
- BIOMG 3330 (4 cr) Summer
- BIOMG 3310 (3 cr) Fall and BIOMG 3320* (2 cr) Spring
  *May substitute with BIOMI 2900 (3 cr, Spring or Fall)
- BIOMG 3350 (4 cr) Spring

INTRODUCTORY BIOLOGY, 8-9 cr
BIOG 1500 (lab, F/S, 2 cr) AND 2 lectures from the following three options:
- BIOMG 1350, (F/S, 3 cr)
- BIOMG 1440 (F/S, 3 cr) OR 1445 (F/S, 4 cr)
- BIOEE 1610 (F/S, 3 cr) OR 1780 (F/S, 3 cr)

PHYSIOLOGY
Choose from:
- NS 3410 (4 cr) Spring
- BIOAP 3110 (3 cr) Fall

GUIDELINES FOR SELECTING COURSES
The NS-CHE, NS-CALS, HBHS, and GPHS programs all depend upon a strong foundation in core biology and chemistry courses. Courses must be taken in the appropriate order and carefully planned because some courses are offered only one term. The specific courses that a student will choose depend upon his/her career goals and prior experience in the subject as well as his/her preferred course format. For example, some courses are offered in an auto-tutorial format in which the student does not attend lecture, but instead works on his/her own completing units according to class requirements.

Students are urged to take the core biology and chemistry courses at Cornell. However, transfer students and students with complex schedules may need to use biology and chemistry courses at other colleges to meet requirements. Only biology and chemistry courses approved by the Associate Director of Undergraduate Studies (B17 Savage) may be used as substitutions. Human Ecology students must submit a "Study in Absentia" form (from the College registrar’s office) along with a course description (including credits, hours and level) and a syllabus (i.e., a list of the topics presented at each lecture).
After completing the course, the student must arrange to have the transcript sent to his/her college registrar in order for the credits to be counted toward his/her degree.

The different options for completing core biology and chemistry courses are described in the following sections of this handout along with the criteria for substitute courses. Students should review the NS-CHE, NS-CALS, HBHS, and GPHS requirements and sample schedules. Pre-med students should consult the Cornell Premedical Guide for the most recent advice regarding biology and chemistry courses required for applicants to medical or dental school. This guide is available from the University Career Center (103 Barnes Hall) and from CALS and CHE career offices.

**INTRODUCTORY CHEMISTRY**
Introductory chemistry should be taken in the freshman year in order to complete prerequisites for more advanced courses. All students must take CHEM 2070 in the fall term and CHEM 2080 in the spring term unless you are only completing GPHS major. CHEM 2150 is the most advanced introductory chemistry and may be chosen by students with AP chemistry score 5. However most of medical schools require 8 cr of college chemistry, so CHEM 2070-2080 sequence will be the best choice among others.

**AP Chemistry:** Students with AP credit in chemistry may apply it toward the introductory chemistry requirement. However, some students may choose to take introductory chemistry here – and not use their AP credit – to become familiar with the material covered and the pace of chemistry at Cornell. AP credit for general chemistry is rarely awarded for premedical students.

**Substitute Introductory Chemistry Courses:** Substitute courses must be at least equivalent to CHEM 2070-2080. When selecting courses at other institutions, choose the introductory chemistry sequence approved for science majors, biology majors, or pre-med majors. Chemistry courses for non-science majors will not provide sufficient preparation for advanced courses at Cornell.

**INTRODUCTORY BIOLOGY**
Biology is usually taken in the freshman year in order to complete prerequisites for advanced courses. Biology may be postponed until the sophomore year, but then it must be taken concurrently with organic chemistry. Students should take BIOG 1500, investigative lab, 2c plus two other lecture courses. For pre-med students, we recommend to take BIOG 1440 (or BIOG 1445), Comparative Physiology and BIOMG 1350, Cell and Developmental Biology as lecture courses. BIOG 1445 is a rigorous course which uses the individualized instruction format including lab contrast to BIOG 1440. BIOG 1445 may be a good choice for students who have strong high school biology backgrounds and may also be a good choice for students who work better in an individualized instructional setting than in a large lecture format.

**AP Biology Credit:** AP test scores are interpreted according to the guidelines for biology majors. Students with AP score 5 may apply AP biology credit to a part of the requirement for introductory biology: up to 4 credits. See “Using AP Credits to Meet Requirements” page for details. Pre-med students should follow the recommendations of the Cornell’s Health Career Advising Program when considering AP credit. Medical schools vary in their acceptance of AP credit for introductory biology courses. Students should check the specific requirements in medical school catalogs.

Most of students take the introductory biology sequence at Cornell to prepare for upper level courses or the medical school admissions tests.

**Substitute Introductory Biology Courses:** Courses at other colleges must be at least equivalent to the Cornell introductory biology requirement and include a year of lab. When selecting courses at other institutions, choose the introductory biology sequence approved for science majors, biology majors, or pre-med majors. Biology courses for non-science majors at other institutions may not provide adequate preparation for advanced courses at Cornell. A key issue in selecting biology courses at other institutions is that whereas all introductory sequences generally cover the same material, they cover the material in different order. Therefore, to get exposure to the breadth of introductory biology, it is often better to complete a two-course sequence at one place than try to match a term elsewhere with a term at Cornell.
ORGANIC CHEMISTRY
Organic chemistry is usually taken in the second year. Cornell offers separate courses for organic chemistry lecture and laboratory.

Organic Chemistry Lecture: Pre-med students and students who wish to prepare for careers in research in the biomedical sciences should take the 6 cr lecture sequence, CHEM 3570 (fall only) and CHEM 3580 (spring only). Note: CHEM 3570 alone will not fulfill the requirement. Students with exceptional interest and preparation in chemistry may take the organic chemistry courses for chemistry majors, CHEM 3590-3600. CHEM 3530 is another one semester organic chemistry lecture course that may be accepted by some medical school.

CHEM 1570 (spring only) is an appropriate organic chemistry lecture for students who are not interested in medicine or biochemistry research.

Organic Chemistry Laboratory: CHEM 2510 is the organic chemistry laboratory course taken by most students, and it is offered in spring, fall, and summer terms. It must be taken concurrently or after one of the lecture courses. CHEM 3010 may also be used as an organic chemistry lab course by students who have taken CHEM 2160 or CHEM 3000.

Substitute Organic Chemistry Courses: Pre-med students who choose to take organic chemistry at another university (generally not recommended) should take the course for premed students. At least eight credits of organic chemistry lecture and lab equivalent to CHEM 3570-3580 and CHEM 2510 are required. Such courses are often called “Organic I and II”, and the lecture and lab may be combined in the same course. Students who are not pre-med may take a one-semester course equivalent to CHEM 1570 and CHEM 2510. Some students choose only to take the lecture elsewhere and take the lab course at Cornell.

PHYSIOLOGY
Physiology is usually taken in the sophomore or junior years. Either NS 3410, Human Anatomy and Physiology (4 cr, Spring), or BIOAP 3110, Animal Physiology (3 cr, Fall), is required.

NS 3410 focuses on human anatomy and physiology.
NS 3420 is a laboratory class of human anatomy and physiology. Both NS 3410 and NS 3420 must be taken for students completing the “dietetics” requirements or “applied exercise sciences minor.”

BIOAP 3110 focuses on comparative animal physiology with little emphasis on humans. Pre-med students and students interested in biochemistry research may benefit from this broader examination of physiology, especially if they will be taking graduate courses in human anatomy and physiology at a later time.

Both NS 3410 and NS 3420 are taken by students who are interested in exercise science or physical therapy. In this situation, students apply one course toward the physiology requirement for the major and the other course toward another requirement for the major or the college.

Substitute Physiology Courses: Physiology courses at other colleges must have a full year of introductory biology as prerequisites in order for these courses to substitute for NS 3410 or BIOAP 3110. Many colleges offer two-semester anatomy and physiology courses that do not have these prerequisites. These courses are usually taught at the level of introductory biology and will not be satisfactory to meet the physiology requirement for NS and HBHS majors. Medical schools and biology departments in four-year colleges will be the best places to find the types of courses needed to substitute for NS 3410 or BIOAP 3110.
BIOCHEMISTRY

Biochemistry is usually taken in the junior year. Introductory biology, organic chemistry, and introductory chemistry (CHEM 2080) are prerequisite to biochemistry. Some students may be able to take biochemistry (BIOMG 3300) concurrently with CHEM 3580 in the spring of the sophomore year. However, this combination may not serve all students well.

The biochemistry requirement asks that students complete a course or courses that provide biochemistry instruction in three areas: (1) proteins, (2) metabolism, and (3) molecular biology.

**NS 3200** (Introduction to Human Biochemistry, 4 cr, Fall, lecture) is designed to cover the three topical areas in biochemistry. This course is the only way to cover all required areas of biochemistry in a lecture format in one semester during the regular academic year at Cornell. The human focus will benefit students who plan to precede to advanced study in human health related fields such as dietetics or exercise science, and who may not be taking further study in human biochemistry in graduate or professional school.

**BIOMG 3300** (Principles of Biochemistry, Individualized Instruction, 4 cr, Fall and Spring) covers all three topics in biochemistry in one semester. The auto-tutorial format of BIOBM 3300 is an excellent choice for students who are organized, self-directed, and motivated to learn biochemistry. The format gives students flexibility in their schedules.

**BIOMG 3310** (Principles of Biochemistry: Proteins and Amino Acids, 3 cr, Fall, lecture) covers only two topic areas: (1) proteins and (2) metabolism. Students who take BIOMG 3310 must take an additional course that covers molecular biology. BIOMG 3320 (Principles of Biochemistry: Molecular Biology, 2 cr, Spring) is the best choice. However, students may use BIOMI 2900 (General Microbiology, Lectures, 3 cr, Spring or Fall) to meet this requirement.

**BIOMG 3330** (4 cr, Summer, lecture) covers all three topical areas of biochemistry.

**BIOMG 3350** (4 cr, Spring, lecture) covers all three topical areas of biochemistry.

**Substitute Biochemistry Courses**: Students who need to take biochemistry at another university must be sure that the course is equivalent to the courses required at Cornell. The course must have organic chemistry as a prerequisite, cover all three topical areas listed above, and involve 4 semester credit hours. The best sources of suitable courses are medical schools and the biology and chemistry departments in four-year colleges and universities.