PREMEDICAL STUDIES

at

COLUMBIA COLLEGE

and

THE FU FOUNDATION SCHOOL OF
ENGINEERING AND APPLIED SCIENCE

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INTRODUCTION

Medical education in the United States falls into three distinct stages: undergraduate studies, medical school, and residency training. The undergraduate education focuses on the basic sciences which form a foundation for the study of medicine (courses are required in Inorganic and Organic Chemistry, Physics, and Biology). In addition to undergraduate coursework, premedical students are expected to test their motivation for a career in medicine by exposing themselves to different venues where clinical medicine is practiced. The content of medical school curricula is similar from program to program. However in recent decades, the structure for imparting that knowledge has undergone widespread reform. There is currently a good deal of difference in the way schools organize their four years of curriculum. However, it can be said that all programs deliver some combination of instruction in the basic medical sciences as well as training in clinical work and patient care. After graduation from medical school, the physician proceeds to a period of intensive clinical residency training of three to five years, sometimes longer, depending on specialty, before being certified to practice independently.

We are concerned here with describing the appropriate curriculum for a premedical student, discussing extracurricular options which may seem pertinent, and explaining the medical school application procedure. It should be noted that while a large number of premedical students have decided upon that track before entrance to Columbia and start right in with the required courses, it is entirely possible to drop into the program at any point in the undergraduate years, or, indeed, thereafter. This may well delay entrance to medical school but is in no way a bar to eventual acceptance.

It should be noted that although we refer throughout to "premed" because the large majority of our students interested in a health profession do plan to enter an MD program, we also have students who apply to schools of osteopathy, dentistry, optometry, podiatry, and veterinary medicine. In largest measure everything we say here applies equally to those schools. To obtain more detailed information about any of these professions, refer to the Office of Preprofessional Advising Website: (http://www.studentaffairs.columbia.edu/preprofessional)

PREPROFESSIONAL ADVISING

Preprofessional Advising is a part of the Center for Student Advising. We are here to serve as a resource to students and alumni during all phases of their premedical preparation. The staff sponsors workshops and programs of interest to premeds and is available to meet one-on-one with any student interested in discussing his/her individual situation. We have prepared this booklet as an introduction, but as you will learn, there is no one “right” way to pursue a premedical path. We look forward to getting to know you over the next few years and hope that you will take full advantage of the resources available at Columbia. Good luck and we’ll see you soon!
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THE PREMEDICAL CURRICULUM

Medical schools in the United States all list as entrance requirements four specific science courses: General Chemistry, Organic Chemistry, Biology, and Physics. Some schools require calculus or some other math options; a few require two years of biology and a handful will have other social science requirements. An increasing number require, or strongly recommend, Biochemistry. Most require a year of English and a few want one or two other non-science courses, usually covered by our core curriculum. While the prescribed Columbia premedical curriculum will cover most of the basics, students should be certain to check with individual schools for additional requirements and recommended courses.

The Major: Medical schools are genuinely indifferent to the student's choice of undergraduate major. They like to see a range of interests in their student body and are just as happy with the art history major (assuming good performance in the required science courses) as they are with the biochemist or electrical engineer. They would not want a class consisting entirely of either. Your choice of major should be guided solely by your own intellectual interests and aptitudes.

Columbia College (CC) has two graduation options: the major and the concentration. Specifics of each are outlined in the department listings in the Bulletin. You should choose the one that suits your own interests best. Both are equally respected by the College and by medical schools. We have seen no evidence that full majors are more likely to win acceptance to medical school. Any way you look at it, you will be taking a minimum of 124 credits in order to graduate. Medical schools are interested in the variety and difficulty of your courses, your course load, and your grades. Whether or not it adds up to a major or concentration is immaterial as long as you are challenging yourself along the way.

The Fu Foundation School of Engineering and Applied Science (SEAS) has one graduation option: the major. Students in SEAS who wish to do so, can declare a premed concentration along with their major and can also add a minor. However, you can apply to medical school without declaring a premed concentration. This does not pose a problem to any student seeking acceptance to medical school. Students from every major have been accepted to medical school, so you need not think that you must major in Biomedical Engineering if you are planning to attend medical school.
Premedical Curriculum – The Basics

Most Medical Schools Require:

- 1 Year of English 6 pts.
- 1 Year of General Chemistry with Lab 8 pts.
- 1 Year of Organic Chemistry with Lab 8 pts.
- 1 Year of Biology with Lab 8 pts.
- 1 Year of Physics with Lab 8 pts.

Math – Variable by School

Biochemistry – a handful of schools require this course

Advanced Biology – some schools require advanced courses in Biology, namely those in Texas

Most common translation here at Columbia:

**ENGLISH:**
University Writing and either Literature Humanities or Contemporary Civilization will generally fulfill this requirement. SEAS students should plan to take one of these options.

ENGL C1010x or y University Writing 3 pts. Teaches general techniques and strategies for academic reading and writing.

HUMA C1001x-C1002y Masterpieces of Western Literature and Philosophy 4 pts. Taught by members of the Departments of Classics, English and Comparative Literature, French, German, Italian, Middle East and Asian Languages and Cultures, Philosophy, Religion, Slavic Languages, and Spanish; and members of the Society of Fellows. Major works by over twenty authors, ranging in time, theme, and genre from Homer to Virginia Woolf. Students are expected to write at least two papers, to complete two examinations each semester, and to participate actively in class discussions.

COCI C1101x-C1102y Introduction To Contemporary Civilization 4 pts. Taught by members of the Departments of Anthropology, Classics, English and Comparative Literature, French, German, History, Middle East and Asian Languages and Cultures, Philosophy, Political Science, Religion, Slavic Languages, and Sociology; and members of the Society of Fellows. A study in their historical context of major contributions to the intellectual traditions that underpin contemporary civilization. Emphasis is on the history of political, social, and philosophical thought. Students are expected to write at least three papers to complete two examinations, and to participate actively in class discussions.

**CHEMISTRY:**
Chemistry should be taken in the first year. All students should take the placement exam at New Student Orientation to determine which sequence is most appropriate. The placement exam results will indicate which lecture and lab is recommended and what semester you should take the lab. You may choose to register for a lower level course, but may not register for a higher level course for which you have not placed into.

**Option 1:**

CHEM C1403-1404 General Chemistry I and II 7 pts.
CHEM C1500 General Chemistry Laboratory 3 pts.

CHEM C1403x-C1404y General Chemistry (Lecture) 3.5 pts. Prerequisites: for C1403: concurrent registration in MATH V1101; for C1404: CHEM C1403 or F1403. No special registration through the Chemistry Department is required.
Only students with scheduling conflicts need report to the Chemistry Department (340 Havemeyer) during registration. Preparation equivalent to one year of high school chemistry is assumed and concurrent registration in Calculus I. Students lacking such preparation should plan independent study of chemistry over the summer or take CHEM F0001 before taking C1403. Topics include stoichiometry, states of matter, chemical equilibria, acids and bases, chemical thermodynamics, nuclear properties, electronic structures of atoms, periodic properties, chemical bonding, molecular geometry, introduction to organic and biological chemistry, solid state and materials science, polymer science and macromolecular structures, chemical kinetics, coordination chemistry, and electrochemistry. Although C1403 and C1404 are separate courses, students are expected to take both terms sequentially. The order of presentation of topics may differ from the order presented here, and from year to year. Recitation Section Required.

CHEM C1500x or y General Chemistry Laboratory 3 pts. Corequisites: CHEM C1403 or F1403. Laboratory Fee: $140. An introduction to basic techniques of modern experimental chemistry, including quantitative procedures and chemical analysis.

Option 2:

CHEM C1604 Second Semester General Chemistry (Intensive) 4 pts.
CHEM C2507 Intensive General Chemistry Laboratory 3 pts.
Or
CHEM C1500 General Chemistry Laboratory 3 pts.

Intensive General Chemistry is appropriate for students who have a 4 or 5 on AP and an acceptable grade on the placement exam. Completion of this course with a grade of C or better will enable a CC or SEAS student to receive 3 credits of AP credit in Chemistry (if they scored a 4 or 5 on AP exam). These AP credits are important to fulfill your year Chemistry requirement for medical school.

CHEM C1604x Second Semester General Chemistry (Intensive) 3.5 pts. Prerequisites: A grade of "B" or better in CHEM C1403 or F1403 or acceptable performance on the Department placement exam. Corequisites: Calculus II. Topics include: Gases (Kinetic Theory of Gases); Binary Collision Model for Chemical Reactions; Chemical Kinetics; Acid-base Equilibria; Thermochemistry (Thermodynamics I); Thermodynamics II Spontaneous Processes; Chemical Bonding in Polyatomic Molecules. Recitation Section Required.

CHEM C2507y Intensive General Chemistry Laboratory 3 pts. Prerequisites: CHEM C1604 or C3045. Laboratory Fee: $140. An introduction to basic techniques and practices of modern experimental chemistry, including qualitative procedures and chemical analysis. This course differs from CHEM C1500 in its emphasis on instrumentation and methods.

Option 3:

CHEM C3045- C3046 Intensive Organic Chemistry 7 pts.
CHEM C2507 Intensive General Chemistry Laboratory 3 pts
CHEM C3545 Organic Chemistry Lab 3 pts.

Intensive Organic Chemistry is appropriate for students interested and who have score of 4 or 5 on Chemistry AP and an appropriate score on placement exam. After completion of CHEM 3045 CC/SEAS students will receive 6 credits of AP for General Chemistry. These AP credits are important to fulfill your year Chemistry requirement for medical school. Students who begin in this sequence should also continue on with Biochemistry.

CHEM C3045x-C3046y Intensive Organic Chemistry for First-Year Students (Lecture) 3.5 pts. Prerequisites: A grade of 5 on the Advanced Placement Examination and an acceptable grade on the placement examinations given during new student orientation. Not open to students who have taken other courses in college-level chemistry. Premedical students
may take CHEM C3045, C3046, and C3545 to meet the minimum requirements for admission to medical school. This course covers the same material as CHEM C3443-C3444, but is intended for students who have learned the principles of general chemistry in high school. The level of instruction is appropriate for those who have not had a college course in general chemistry. Students enrolled in CHEM C3045-C3046 are expected to enroll concurrently in CHEM C2507.

CHEM C2507y Intensive General Chemistry Laboratory 3 pts. Prerequisites: CHEM C2407. An introduction to basic techniques and practices of modern experimental chemistry, including qualitative procedures and chemical analysis. This course differs from CHEM C1500 in its emphasis on instrumentation and methods. The lab should be taken in the fall semester.

CHEM C3545x Organic Chemistry Laboratory 3 pts. Prerequisites: CHEM C3045 and C3046 and C2507. Laboratory Fee: $125. The course covers the same material as CHEM C3543, but is intended for those students who have taken Intensive Organic Chemistry for First-Year Students, CHEM C3045-C3046.

ORGANIC CHEMISTRY

Those students who took General Chemistry or Intensive General Chemistry in their first year will take Organic Chemistry in either their sophomore or junior year.

CHEM C3443-3444 Organic Chemistry 7 pts.
CHEM C3543 Organic Chemistry Lab 3 pts.

CHEM C3443x-C3444y Organic Chemistry (Lecture) 3.5 pts. Prerequisites: CHEM C1404 or F1404 or C1604, and C1500 or F1500. The principles of organic chemistry. The structure and reactivity of organic molecules are examined from the standpoint of modern theories of chemistry. Topics include stereochemistry, reactions of organic molecules, mechanisms of organic reactions, syntheses and degradations of organic molecules, and spectroscopic techniques of structure determination. Recitation Section Required.

CHEM C3543x or y Organic Chemistry Laboratory 3 pts. Prerequisites: CHEM C1500 or F1500. Corequisites: CHEM C3443 or F3343. Laboratory Fee: $125. Students planning to take a full year of laboratory should enroll in CHEM C3543 and C3546. Techniques of experimental organic chemistry, with emphasis on understanding fundamental principles underlying the experiments in methodology of solving laboratory problems involving organic molecules.

BIOLOGY

Biology is most often taken by students in their sophomore year.

Option 1

Lecture:
BIOL C2005-C2006 Intro to Biology I and II 8 pts.

BIOL C2005 Introductory Biology I: Biochemistry, Genetics & Molecular Biology 4 pts. Prerequisites: One year of college chemistry, or a strong high school chemistry background. Lecture and recitation. Recommended as the introductory biology course for biology and related majors, and for premedical students. Fundamental principles of biochemistry, molecular biology, and genetics. Website: http://www.columbia.edu/cu/biology/courses/c2005/index.html

Lab:
BIOL W2501 Contemporary Biology Lab 3 pts.

BIOL W2501 Contemporary Biology Laboratory 3 pts. Corequisites: Strongly recommended prerequisite or required corequisite: BIOL C2005 or F2401. Enrollment limited to 24 students per section. Attendance at the first class is mandatory. Fee $150. Emphasis on experimental techniques and data analysis in a variety of biological disciplines.

BIOL W2501 is the most common lab taken by premedical students, but students may also pursue any lab options accepted by the Biology Department in fulfillment of the lab requirement for the Biology major. A student may also fulfill the laboratory requirement by taking:

- a 5-point biology laboratory; or
- two terms of BIOL C3500 taken for a letter grade, including the submission of a satisfactory research report; or
- BIOL W3002; or
- with permission of the Summer Undergraduate Research Fellowship (SURF) director or director of undergraduate studies, one summer of research as part of the Columbia SURF program (see below), plus one term of BIOL C3500 in the same laboratory.

* Biomedical Engineering students may be exempt from lab with the completion of their 3 BME labs.

Option 2

Lecture:
EEEB W2001 Environmental Biology I: Molecules to Cells 4 pts.
BIOL C2006 Intro to Biology II: Cell Biology and Physiology 4 pts.

EEEB W2001x Environmental Biology, I: Molecules To Cells 3 pts. Introductory biology course for majors in biology or environmental biology, emphasizing the ecological and evolutionary context of modern biology.


Lab:
BIOL W2501 Contemporary Biology Lab 3 pts.

BIOL W2501 Contemporary Biology Laboratory 3 pts. Corequisites: Strongly recommended prerequisite or required corequisite: BIOL C2005 or F2401. Enrollment limited to 24 students per section. Attendance at the first class is mandatory. Fee $150. Emphasis on experimental techniques and data analysis in a variety of biological disciplines.
**BIOL W2501** is the most common lab taken by premedical students, but students may also pursue any lab options accepted by the Biology Department in fulfillment of the lab requirement for the Biology major. A student may fulfill the laboratory requirement by taking:

- a 5-point biology laboratory; or

- two terms of **BIOL C3500** taken for a letter grade, including the submission of a satisfactory research report; or

- **BIOL W3002**; or

- with permission of the Summer Undergraduate Research Fellowship (SURF) director or director of undergraduate studies, one summer of research as part of the Columbia SURF program (see below), plus one term of **BIOL C3500** in the same laboratory.

* Biomedical Engineering students may be exempt from lab with the completion of their 3 BME labs.

**PHYSICS**

SEAS students and some CC students interested in majors in Physics should take Physics during their first year. Other CC students generally take Physics either sophomore or junior year. There are four different Physics sequences. Students should choose a sequence based on their background in mathematics and their planned course of study.

**Option 1**

**PHYS V1201-V1202 General Physics**  6 pts.
**PHYS V1291-V1292 General Physics Laboratory**  2 pts.

This option is appropriate for all premedical students with the **exception of SEAS students, and those interested in Physics, Biophysics, Chemical Physics and Astronomy.**

**PHYS V1201x-V1202y General Physics** 3 pts. Prerequisites: Prerequisite for PHYS V1202: PHYS V1201. The course will use elementary concepts from calculus. Students should therefore have some basic background in calculus or should be concurrently taking **MATH V1101, Calculus I.** The accompanying laboratory is **PHYS V1291-V1292.** Basic introduction to the study of mechanics, fluids, thermodynamics, electricity, magnetism, optics, special relativity, quantum mechanics, atomic physics, and nuclear physics. Science Requirement: Partial Fulfillment.

**PHYS V1291x-V1292y General Physics Laboratory** 1 pt. Corequisite: **PHYS V1201-V1202.** This course is the laboratory for the corequisite lecture course and can be taken only during the same term as the corresponding lecture.

**Option 2 – 4**

Students must complete a lecture sequence and choose a lab based on their program of study.

**LECTURE OPTIONS**

2. **PHYS C1401-C1402 Physics**  6 pts.

**PHYS C1401x Introduction To Mechanics and Thermodynamics** 3 pts. Corequisite: **MATH V1101 or V1105,** or the equivalent. Fundamental laws of mechanics, kinematics and dynamics, work and energy, rotational dynamics, oscillations,
gravitation, fluids, temperature and heat, gas laws, the first and second laws of thermodynamics. Science Requirement: Partial Fulfillment.

PHYS C1402y Introduction To Electricity, Magnetism, and Optics 3 pts. Prerequisite: PHYS C1401. Corequisite: MATH V1102 or V1106, or the equivalent. Electric fields, direct currents, magnetic fields, alternating currents, electromagnetic waves, polarization, geometrical optics, interference, and diffraction. Science Requirement: Partial Fulfillment.

3. PHYS C1601 – C1602 Physics 7 pts.

PHYS C1601x Physics, I: Mechanics and Relativity 3.5 pts. Corequisite: MATH V1102 or the equivalent. Fundamental laws of mechanics, kinematics and dynamics, work and energy, rotational dynamics, oscillations, gravitation, fluids, introduction to special relativity and relativistic kinematics. The course is preparatory for advanced work in physics and related fields. Science Requirement: Partial Fulfillment.

PHYS C1602y Physics, II: Thermodynamics, Electricity, and Magnetism 3.5 pts. Prerequisite: PHYS C1601. Corequisite: MATH V1201 or the equivalent. Temperature and heat, gas laws, the first and second laws of thermodynamics, kinetic theory of gases, electric fields, direct currents, magnetic fields, alternating currents, electromagnetic waves. The course is preparatory for advanced work in physics and related fields. Science Requirement: Partial Fulfillment.

4. PHYS C2801-C2802 Accelerated Physics I and II 9 pts.

PHYS C2801x-C2802y Accelerated Physics, I and II 4.5 pts. Prerequisites: Advanced Placement in physics and mathematics, or the equivalent, and the instructor's permission. (A special placement meeting is held during Orientation.) This accelerated two-semester sequence covers the subject matter of PHYS C1601, C1602 and C2601, and is intended for those students who have an exceptionally strong background in both physics and mathematics. The course is preparatory for advanced work in physics and related fields. There is no accompanying laboratory; however, students are encouraged to take the intermediate laboratory, PHYS W3081, in the following year.

LAB OPTIONS

PHYS V1291-V1292 General Physics Lab 2 pts.
PHYS C1493 Experimental Physics Lab 3 pts.
PHYS C1494 Experimental Physics Lab 3 pts.
PHYS C2699 Experiments in Classical and Modern Physics 3 pts.
PHYS W3081 Intermediate Lab 2 pts.

PHYS V1291x-V1292y General Physics Laboratory 1 pt. Corequisite: PHYS V1201-V1202. This course is the laboratory for the corequisite lecture course and can be taken only during the same term as the corresponding lecture.

PHYS C1493x Introduction To Experimental Physics 3 pts. Prerequisite: PHYS C1401 and C1402. Laboratory work associated with the two prerequisite lecture courses. Experiments in mechanics, thermodynamics, electricity, magnetism, optics, and wave motion. Note: Students cannot receive credit for both PHYS C1493 and C1494.

PHYS C1494y Introduction To Experimental Physics 3 pts. Prerequisite: PHYS C1401, C1402, and C1403. Laboratory work associated with the three prerequisite lecture courses. Experiments in mechanics, thermodynamics, electricity, magnetism, optics, wave motion, atomic physics, and nuclear physics. (Students cannot receive credit for both PHYS C1493 and C1494.)
PHYS C2699y Experiments In Classical and Modern Physics 3 pts. Prerequisites: PHYS C1601 (or C1401), C1602 (or C1402), and C2601. Laboratory work associated with the three prerequisite lecture courses. Experiments in mechanics, thermodynamics, electricity, magnetism, optics, wave motion, atomic physics, and nuclear physics.

PHYS W3081x or y Intermediate Laboratory Work 2 pts. Primarily for junior and senior physics majors. Other majors require the instructor's permission. May be repeated for credit by performing different experiments. The laboratory has available thirteen individual experiments, of which two are required per 2 points. Each experiment is chosen by the student in consultation with the instructor. Each section meets one afternoon per week, with registration in each section limited by the laboratory capacity. Experiments (classical and modern) cover topics in electricity, magnetism, optics, atomic physics, and nuclear physics.

MATHEMATICS
Although Math is not required by all medical schools, it’s a good idea to have a full year of Calculus in order to be eligible to apply to all schools.

AP credit can, in most cases, be applied toward this one year recommended math requirement.

MATH V1101x or y Calculus I 3 pts. Prerequisites: see Courses for First-Year Students. Functions, limits, derivatives, introduction to integrals.

MATH V1102x or y Calculus II 3 pts. Prerequisites: MATH V1101 or the equivalent. Methods of integration, applications of the integral, Taylor's theorem, infinite series. (SC)

MATH V1201x or y Calculus III 3 pts. Prerequisites: MATH V1101 with a grade of B or better or Math V1102, or the equivalent. Vectors in dimensions 2 and 3, complex numbers and the complex exponential function with applications to differential equations, Cramer's rule, vector-valued functions of one variable, scalar-valued functions of several variables, partial derivatives, gradients, surfaces, optimization, the method of Lagrange multipliers.

OTHER REQUIREMENTS
There are some schools that require additional coursework. Students need to pay close attention to the requirements at the schools to which they hope to apply. Additional requirements may include Biochemistry, other advanced Biology course(s) and/or other social sciences.
THE FIRST YEAR OF THE PREMEDICAL CURRICULUM

COLUMBIA COLLEGE

Chemistry: Most students will take Chemistry C1403-1404. The accompanying one semester lab course C1500 can be taken either concurrently or in another year (you will receive recommendations about when to take lab from placement exam results). Those who have advanced preparation in Chemistry and an AP score of 4 or 5 on the Chemistry AP test and an appropriate grade on the Chemistry department placement exam given during orientation may be advised to take Second Semester Chemistry (Intensive) (C1604) followed by the laboratory course (C2507 or C1500) or . Intensive Organic Chemistry for First Year Students (C3045-C3046) and appropriate labs (C2507 and C3543).

Biology: Students are generally expected to take an introductory biology course at Columbia even if they have a 5 on the Biology AP test. This course is normally not taken until the second year. Students interested in a major in Ecology, Evolution, and Environmental Biology may elect to take EEEB W2001 in their first year. Premedical students who choose this course are advised to take first-year Chemistry at the same time and plan to take Biology C2006 rather than Environmental Biology EEEB W2002 in the spring.

First-year students may take Biology EEEB W2001 without special permission.

Mathematics: Calculus should be taken in the first year or concurrently with Chemistry.

Physics: Of the various levels of introductory physics, the appropriate choice for premedical students will depend on their preparation in mathematics and the extent to which they wish to pursue advanced science courses. Students seriously considering a major in physics should consider beginning physics during the first year.

ENGINEERING

The courses that are required of you as a first-year engineering student fulfill a significant portion of the entrance requirements to medical school. In the first year, all SEAS students are required to take calculus, physics, and chemistry.
THE SECOND YEAR OF THE PREMEDICAL CURRICULUM

COLUMBIA COLLEGE
The sophomore year of college is a time to complete core requirements, proceed with premed requirements, and sample courses for a prospective major or concentration. There are many, many alternatives, none of which are wrong, but one of which is probably best for you. You should discuss your choices carefully with your Advising Dean or Counselor.

Many premedical students consider doubling up on their science prerequisites during the sophomore year, often taking the combination of Biology and Physics, or Organic Chemistry and Physics. It is important, especially for non-science majors, to demonstrate an ability to handle the rigor of multiple sciences in the same semester. Sophomore year is often a good time to tackle this. You may choose to double up during junior year, but this may be more challenging for this is a time when you might also be completing upper division courses in the major or concentration, taking on leadership roles in student organizations, and beginning preparation for the MCAT.

ENGINEERING
You will be completing the calculus, chemistry, and physics sequence as required by SEAS and any prerequisite courses for your intended major. The premedical English requirement can be fulfilled by either Literature Humanities or Contemporary Civilization. We recommend Literature Humanities.

You should take either Biology or Organic Chemistry in the sophomore year. If you wish, you can take the off-sequence version offered by Barnard (part one in the spring of sophomore year and part two fall semester of junior year) if it is not required by your major. Please note that Biomedical Engineering majors do not need to take Biology Lab W2501 because, in general, medical schools will accept the BME labs required for the major.

THE THIRD YEAR OF THE PREMEDICAL CURRICULUM
By the end of your sophomore year you should have chosen your major or concentration. What you take as a junior is determined by that choice and by the sciences you have taken as a sophomore. During this year, you will complete all the premedical sciences with the possible exception of a lab. You will complete the core, if you have not already done so, and you will continue taking courses in your major/concentration. For students planning to apply to go straight to medical school after graduating, this year will end with you taking the MCAT either in the spring or early summer.

THE FINAL YEAR OF THE PREMEDICAL CURRICULUM
As a senior (if you are applying to go straight on to medical school) you will already have completed all of your premedical requirements with the possible exception of an upper level Biology course or a lab. The rest of your courses will be major requirements and electives. Occasionally the non-science major, who would not otherwise be taking any further science requirements as a senior, but has a lower science GPA may wish to take an additional science or two (usually advanced biology or biochemistry) in the fall.
SPECIAL NOTES ON COURSES

LABS: It is generally desirable to complete the labs before senior year; however, this is not critical. Biology and Biochemistry majors often will not take the major lab until senior year, and this presents no problem. Others may put off either the Biology or the Organic Chemistry lab until senior year if necessary. However, the biology lab may be useful for MCAT preparation and, therefore, it would help to do it by the end of junior year.

Barnard Courses: It is permissible to take premed requirements at Barnard or the School of General Studies. It should be noted, however, that the Biology and Chemistry Departments in the College may not accept the courses towards the major. You should discuss this decision with your Advising Dean or Counselor before making a decision.

The basic premedical and predental requirements at Barnard are two semesters of introductory biology (BIOL BC 1500 and BC 1502) and two semesters of biology laboratory (BIOL BC 1501 and BC 1503) two semesters of general chemistry and one semester of laboratory (CHEM BC 2001, BC 3232); two semesters of organic chemistry and one semester of organic laboratory (CHEM BC 3230, BC 3231, BC 3328); two semesters of physics with accompanying laboratory (PHYS BC 2001, 2002 [calculus I and II are pre- or corequisites] or V 1201, V 1202, V 1291, and V 1292 [calculus I prerequisite].

You should have good reason for taking courses at Barnard and if you elect a sequence there you should try to take the entire sequence for consistency.

Note: some Barnard sequences begin in the spring and end in the fall. Thus, before choosing a Barnard sequence, please discuss the pros and cons with your adviser.

Summer Courses at other institutions are not transferable to Columbia (CC ONLY) except in a few clearly outlined circumstances. Summer work at Columbia is, of course, acceptable. IT IS NOT, HOWEVER, DESIRABLE TO TAKE ANY OF THE PREMEDICAL REQUIREMENTS IN THE SUMMER except in unusual circumstances. Occasionally, a student’s schedule will require taking summer courses, but the reason should not be to lighten your load during the academic year. Medical schools want to be assured of an applicant’s capacity to handle heavy science loads and therefore may question your decision to take summer courses. Again, please consult an adviser before taking required premedical courses during summer session.

The curriculum at SEAS can be very full, thereby requiring you to take one of the required premedical courses during a summer. Because SEAS students typically take four science courses a semester, a course taken over the summer won’t raise the same concerns as it might for student’s enrolled at the College. However, taking courses over the summer might lead you to miss out on other important opportunities, including summer research and clinical experiences.
THE MCAT

The Medical College Admission Test (MCAT) is a standardized, multiple-choice examination designed to assess problem solving, critical thinking, and writing skills in addition to knowledge of science concepts and principles prerequisite to the study of medicine.

In order to be prepared to take the MCAT, students should have successfully completed all premedical prerequisite courses (with the exception of labs). The timing of your MCAT depends on your application timeline. If you plan to apply to go straight on to medical school after graduation, you will need to take the MCAT in the spring or early summer of your junior year or before.

The test consists of four sections: Verbal Reasoning, Physical Sciences, Biological Sciences, and a Writing Sample. Medical college admission committees consider an applicant’s MCAT scores as part of their admission decision process.

The MCAT is now offered exclusively as a computer-based test. It will be offered on multiple test dates throughout the year, including test dates in January, March, April, May, June, July, August, and September. For a full calendar of test dates and sites, please refer to the MCAT section of the AAMC website: www.aamc.org

The MCAT is a test you can and should prepare for. Whether you do it by means of a commercial preparatory course, or on your own with one of the myriad preparation books, is a matter of personal taste. Whichever you do, you should probably make some attempt to lighten your course or activities load during the semester/summer when you prepare.

Timing is essential for the medical school application, and it will be important that you take this test in a timely manner. It is helpful to consult a premedical adviser regarding your individual timing.
EXTRA-CURRICULAR OPTIONS FOR PREMEDS

It is first of all important to understand that medical schools are quite genuinely interested in what you have done in college besides take courses and prepare for the MCAT. You really are more than a composite of GPA and MCAT scores. However, it is equally important to understand that impressive extracurricular involvement will not save you if your numbers are too low. You will have to figure out for yourself what the appropriate balance is. The medical profession needs people who have learned how to balance their professional responsibilities and their personal lives. Some doctors will tell you it is the hardest thing they had to learn, and some, to their detriment, never learn. College is not a bad time to start.

By and large, your choice of extra-curricular activities should be guided quite simply by your interests. There is nothing intrinsically better about a cultural organization, a literary society, or the football team. Leadership in one or two things rather than membership in many is probably more attractive, but really, this is an area where you should simply do what appeals to you. It may well be true that activities which involve taking care of people (children, the elderly, and the homeless) are appealing to medical schools, but so are activities that demand judgment, efficiency, organization, team work. Do what suits you. Also consider sticking with whatever you begin. Depth of involvement in an activity often leads to leadership opportunities, and this type of depth and commitment is something that is valued by professional schools. Finally, community involvement outside of the Columbia gates is also something that you may consider. Since medicine is a service-related profession, demonstrating that you have a history of serving others is certainly helpful. Community work also provides you with the opportunity to step outside of your comfort zone, interacting with diverse populations.

Paid employment must also be seen as an extra-curricular activity. It is recognized that some students must work in order to help contribute to their college expenses. Although it would no doubt be pleasant and interesting for you to be able to work in some medically related field—a doctor's office, a hospital, a lab—this is not always possible. However, a great many non-medical jobs will require intelligence, responsibility, integrity, judgment, good humor, and the ability to deal well with the public. All of these things and many more are of interest to schools. The point is to do whatever you are doing well and look for opportunities where you will grow and develop as an individual.

There are two areas of extracurricular activity that may be seen as specifically appropriate for premeds: lab experience and clinical experience.

There is a long-standing myth that medical schools "expect" lab experience. It is certainly true that much of the information upon which medical treatments are based was ascertained in the laboratory. It is also true that participating in a laboratory experience will help you to be a more literate reader of the current research. But an outside lab experience is not absolutely required for entrance into medical school. The exception here is the student who, in fact, wishes to pursue a career in medical research and may even be applying for a combined MD/PhD degree. If these are your interests, you will not only want, but need, to get extensive experience in research beyond that provided by your course work. Opportunities are legion, both in our own departments and at our medical school (including those through the Summer Undergraduate Research Fellowships), but also at many of the medical schools and research establishments throughout the city and around the nation.
Clinical exposure is a different matter. There is obviously nothing at all in your premedical course work which prepares you for the actual business of taking care of sick people. Many kind, compassionate, concerned, good-hearted individuals find that their own particular personality is not at all suited for medical care-taking. It is better to find that out before going to medical school rather than after. Clinical exposure will also help you to demonstrate your commitment and knowledge of the field of medicine.

There are a number of ways in which a Columbia student can acquire clinical experience. Probably the most convenient is volunteering at St. Luke's Hospital. It's right here, it's one of Columbia's own teaching hospitals, and it’s accustomed to training prospective physicians at every stage of education. The program is not open to first-year students until second semester. It is also possible to volunteer in a number of other hospitals and other healthcare delivery settings throughout the city and often near your own home in the summers. Please refer to our volunteer list at:

PREMEDICAL RELATED STUDENT ORGANIZATIONS
This list is just a sampling – there are too many related organizations to list. Please attend the Activities Fair and check out the Student Development and Activities website to peruse other opportunities.

AMSA
The American Medical Student Association is a premedical society at Columbia University. This student club is a great community of students who share an interest in attending medical school. They plan programs and different lectures that are of interest to its members. For more information see: www.columbia.edu/cu/cuamsa

CU-EMS
Columbia University Emergency Medical Service is a Division of Health Services at Columbia and the Department of Public Safety. It is a student operated, New York State certified, Basic Life Support (BLS) volunteer ambulance corps. CU EMS provides pre-hospital emergency medical care, free of charge, to Columbia University's Morningside Heights Campus and the surrounding area 24 hours a day, 7 days a week, 365 days a year. The corps has approximately 65 active members and responds to over 700 emergency calls per year.

CHARLES DREW SOCIETY
The Charles Drew Premedical Society was established in order to increase the number of minority students applying and entering into health professional schools. Charles Drew serves as a support group and a resource for all underrepresented premedical students in the Columbia community.

PEER HEALTH EXCHANGE
Peer Health Exchange recruits and trains students to teach health education in underresourced high schools in NYC. Volunteers teach twelve different workshops ranging from sexual health to substance abuse and nutrition. This is a great way to gain leadership experience and to impact the lives of young people.
THE APPLICATION PROCESS

Students who wish to enter medical school in the fall following graduation from college will complete the application process in the summer between junior and senior years. Detailed instructions about the timetable and procedures are available for each new class in the fall of junior year, and there will be general meetings for all prospective applicants to review the entire process. The important points to bear in mind before that time are the following:

Premedical Advisers
During your first two years, you and your Advising Dean will work out a program, which includes the premed courses. In the fall or spring of your sophomore year, you will declare your major or concentration and you will be assigned a new adviser from your department. You are also welcome to meet with an adviser in Preprofessional Advising at any time. Your official premed adviser will be assigned to you as soon as you complete and submit the Premedical Advisory Committee Application. Your premed adviser will guide you through the application process and contribute to the writing of your committee evaluation for medical school.

Premedical Advisory Committee Letter of Evaluation

The Premedical Advisory Committee (PAC) Evaluation is a comprehensive letter of evaluation and supporting document that is written for current students and alumni applying to graduate schools of the health professions. It is designed to provide the admissions committee with a complete understanding of each candidate’s background and experiences both academic and otherwise.

This letter is written on a student’s request and only after the student completes all committee application requirements by the stated deadline. The committee application includes submission of letters of recommendation, resume, autobiography, activities grid, supplemental information form, as well as an interview with the PAC.

During the fall semester, the Office of Preprofessional Advising will hold an informational meeting for all students planning to apply to medical, dental, or veterinary school in the coming summer. At this time the application for the Committee Evaluation will be distributed and students will register their intent to apply to health professional school in the coming summer.

It is highly advisable to start accumulating letters of recommendation from faculty, employers, etc. at the end of each semester, unless you expect to have a continued association with your prospective referee, in which case you will request the letter directly prior to application. Forms are available on the Preprofessional website: http://www.studentaffairs.columbia.edu/preprofessional/health/forms/. These letters should be sent by the writer (give that person an addressed envelope) to the Center for Student Advising/Preprofessional Advising (403 Lerner). The letters of reference will be kept on file until your application year. The recommendation waivers must accompany each letter received in our office and you must make a consistent decision for all of your letters regarding the waiver. This is essential because eventually all of your letters will become a part of the Premedical Advisory Committee Letter of Evaluation. If you have questions about this, please consult a preprofessional adviser.
Application Timing
Many students choose to apply to medical school after they have graduated from college. This may be because they started premed courses later in their college careers, because they had poor grades initially and want to improve their records before applying, because they are not yet quite sure that they want to enter the medical profession and need more time to explore, or because they want to spend some time achieving other goals before starting medical school. Whatever the reason, it is always better to wait to go to medical school until you are absolutely sure you are ready. It is too pressured and too expensive to embark upon casually. Medical schools have absolutely no bias against older applicants, and many students will present a much more impressive profile if they wait a bit. Columbia will, of course, continue to assist you in the application process whenever you choose to apply. In fact, approximately 65% of the applicants to medical school from Columbia have already graduated from college and take at least one year between college and medical school.

Medicine is a profession which waxes and wanes in popularity. Over the past decade we have experienced an increase nationally in the number of applicants to medical school, and these numbers remain extremely high. Whatever the case may be, Columbia regularly sees a very high percentage of its applicants accepted to medical school. Broadly educated students, who have been involved in life as well as books, do extremely well in the competition. The key seems to be to see yourself first as a Columbia student, and second, as a premed.
SUBSCRIBE TO THE

CCSEAS-PRE-HEALTH LISTSERV

The listserv provides students and alumni with information about upcoming on and off-campus events, scholarships, volunteer and research opportunities, summer programs, and other relevant information for those interested in health professions.

To subscribe, send an e-mail to LISTSERV@cuvmc.ais.columbia.edu.

Leave the subject line blank and delete signature lines. In the body of the text, type

subscribe ccseas-pre-health Your Name (no quotations or e-mail address)

Subscribers will receive a message requiring them to respond within 48 hours and type okay in the body of the text. That's it!

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