COLUMBIA COLLEGE
FU FOUNDATION SCHOOL OF ENGINEERING AND APPLIED SCIENCE

PREMEDICAL HANDBOOK

2025-2026
Edition

PREPROFESSIONAL ADVISING

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COVID and the impact on preparing for medical school

This handbook is designed to introduce Columbia students (CC and SEAS) to the premedical prerequisites and the courses at Columbia that students typically take to fulfill them. It also contains other information regarding aspects of preparing for medical school both academically and experientially. While all of the content remains accurate, the COVID-19 pandemic created some issues where general advice may have shifted or where answers to some questions involve uncertainty. While current undergraduate students at Columbia were in middle school and high school during the pandemic, it might be helpful to understand this information to help you make sense of advice you may hear during your time at Columbia.

All prerequisite courses should be taken for a letter grade (which means *not* P/D/F (Columbia College) or P/F (SEAS)). While there was some leeway around this during the start of the pandemic, the expectation of letter grades is back and you should receive letter grades for all prerequisite courses if you want medical schools to count them. In general, Pass/Fail options should be used very sparingly during your undergraduate career.

Also we encourage students to be careful about their decision to take prerequisite courses during the summer. Again this advice shifted around the pandemic when so much was cancelled, but we are back to the original expectation that overall summers are ideally used for something other than coursework.

Along the same lines, typically we discourage students from taking courses online as medical schools sometimes don't accept them for prerequisite courses. However, under COVID-19, attitudes around online course shifted somewhat and now there are medical schools who will accept online courses under certain circumstances. If you are thinking about taking a required premedical course either during the summer or online, you should discuss this with a premedical advisor.

Finally, we encourage students to be active in their communities and to pursue vibrant in-person clinical experiences to investigate and affirm their interest in medicine. For current undergraduate students, getting in-person clinical exposure is an essential part of a strong medical school application.

INTRODUCTION

This booklet is designed for all Columbia College and Fu Foundation School of Engineering and Applied Science students who are considering a career in the health professions. While each undergraduate is assigned an Advising Dean in the Center for Student Advising, prehealth students are also expected to work directly with a prehealth advisor throughout their time at Columbia. You are not assigned a prehealth advisor however and are free to meet with any of us. We hope that you find this document helpful, and we look forward to getting to know you!

Medical education in the United States falls into three distinct stages: undergraduate studies, medical school, and residency training. The undergraduate education focuses on coursework which provides the foundational concepts necessary for your success in medical school. In addition to undergraduate coursework, premedical students are expected to investigate and 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 three to 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 pertinent extracurricular options, and explaining the medical school application procedure. It should be noted that while a large number of premedical students have decided upon medicine 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. In fact, it is worth noting that the average age of first-year medical school students nationwide is 24-25.

It should also be noted that although we refer throughout this publication to "premed" because the large majority of our students interested in a health profession do plan to enter MD/DO and MD/PhD programs, we also have students who apply to schools of, dentistry, public health, veterinary medicine, and other health professions. To obtain more detailed information about any of these professions, refer to the Preprofessional Advising Website:
(**https://www.cc-seas.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 advising team 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 document 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.

ACADEMIC PREMEDICAL PREPARATION

It is very important to note that medical schools in the United States and Canada each individually determine their own entrance requirements, including prerequisite coursework and/or competencies. Each medical school also sets its own rules about acceptable courses or course equivalents. Therefore, it is essential that you check the premedical requirements both for your state school(s) and any other medical school where you think you may apply when planning your curriculum. The Association of American Medical Colleges (AAMC) maintains a list of prerequisites by school which you can access here: Medical School Prerequisites. In addition to medical school course requirements, all medical schools currently require that you sit for the MCAT exam. In preparation for the MCAT and to meet perquisites at most medical schools, we recommend the following courses at Columbia:

2 semesters (1 year) General Chemistry and General Chemistry Lab*
2 semesters (1 year) Introductory Biology and Biology Lab*
2 semesters (1 year) Organic Chemistry and Organic Chemistry Lab*
2 semesters (1 year) General Physics and Physics Lab*
1 semester of Biochemistry
1 semester of Introductory Psychology**
1 semester of Statistics***

While these courses are those recommended to prepare you for the MCAT, there are indeed additional requirements set by individual schools. With all of this coursework, there are two issues at stake: what will help you prepare for the MCAT and what medical schools require as prerequisites. There is overlap between these things but not an absolute correspondence.

*At Columbia, Gen Chem Lab and Bio Lab are one semester courses, worth 3 credits each. Orgo Lab and Physics Labs are two semesters, 1.5 and 1 credit each term, respectively. Whether it is a one semester course or a two semester sequence, they all fulfill the “one year of lab” requirement.

**This course is recommended to help you prepare for the MCAT. However most medical schools do not have a behavioral science course requirement.

***Many medical schools don’t require math or statistics specifically. However, some medical schools do and some name statistics as a prerequisite. Statistics is essential in medicine because it allows you to critically analyze data and research.

Additional Information on Requirements:

- Most medical schools require a year of English – emphasizing the development of critical reading, writing, and thinking skills.

- Many medical schools currently require mathematical competency focused in areas covered in calculus and statistics. We therefore recommend that all students also complete one semester of calculus and one of statistics.

- There is a section of the MCAT that covers topics from introductory psychology and sociology. There is not a sociology class at Columbia that closely covers this material however. Many of our applicants end up self-studying this content and do just fine.

- A smaller subset of schools require *more* than one year of introductory biology. Many recommend specific advanced level classes. If you are a Texas resident, you should pay particular attention to your state school requirements as they are among the schools that require the additional biology.

- A few schools have social and behavioral science courses in their requirements including, but not limited to, psychology and sociology.

PLEASE NOTE: It is your responsibility to keep up to date with prerequisite requirements for the schools to which you intend to apply. These are subject to change from year to year. In addition to the link above, you can check the current edition of the MSAR (Medical School Admission Requirements, subscription required to access prerequisite information), which is updated annually and released in April, for the most up-to-date information. Most medical schools also list their requirements in greater detail on their individual websites.

The Major

Medical schools genuinely do not have a preference regarding a 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 biologist or chemical 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. Premed is not a major and therefore in addition to completing coursework to prepare for medical school, students will all choose a major and may pursue minors or special programs.

Columbia College (CC) has one graduation option: the major. Students in CC who wish to do so, can also declare a minor or a special program. We have not seen evidence that double majors or even majors plus minors are more likely to earn acceptance to medical school than applicants who have a single major. Any way you look at it, you will be taking a minimum of 124credits in order to graduate. Medical schools are interested in the variety and difficulty of your courses, your course load, and your grades.

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 also declare a minor. Students from every SEAS 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. However, you should consider a plan for completing required prerequisite courses alongside your major, for there is more limited freedom in engineering course plans.

PREMEDICAL COURSES AT COLUMBIA

This list of courses combines those which may be required by medical schools and those that will help you to prepare for the MCAT.

	Required by most medical schools	Required by some medical schools	Recommended for preparation for MCAT
1 Year of English	x		
1 Year General Chemistry with Lab	x		x
1 Year of Introductory Biology (Cell and Molecular) with Lab	x		x
Additional Biology		x	
1 Year of Physics with Lab	x		x
1 Year of Organic Chemistry with Lab	x		x
1 Year of Mathematics (1 sem each Calc and Stat)		x	x
1 Semester Biochemistry	x (strongly recommended by all medical schools)		x
1 Semester of Introductory Psychology		x	x

One year is comprised of two semesters of a lecture course. One year of lab is 2 credits or more which can be met at Columbia via some one semester courses and some two semester sequences.

The following lists the most common course options at Columbia for both CC and SEAS students.

ENGLISH:
University Writing and either Literature Humanities or Contemporary Civilization will generally fulfill this requirement. SEAS students would be well served by choosing one of these options. SEAS students may also take another English literature course to fulfill this requirement in addition to University Writing. NOTE: Global Core classes will NOT fulfill this requirement UNLESS they are in the English Department.

ENGL CC1010 University Writing *3 pts.* Teaches general techniques and strategies for academic reading and writing.

HUMA CC1001-C1C002 Literature Humanities I and II, *4 pts each.* 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 ancient texts 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 CC1101-CC1102 Contemporary Civilization I and II, *4 pts each.* 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, or first amongst the premedical requirements. Most premedical students will take General Chemistry. Students who want to be considered for an advanced chemistry sequence should take the placement exam. The placement exam results will indicate which lecture is recommended. You may choose to register for a lower level course, even if you place into a higher one. Please note: if you take an upper-level sequence and do NOT have a 4 or 5 on the AP or IB exam, you may end up without enough prerequisite course credit in chemistry. There are some medical schools who currently do not accept AP credit and may require additional chemistry courses if you begin with the Organic Chemistry track. **The one semester General Chemistry laboratory is equivalent to a year of lab for medical school purposes and can be taken during either term.**

<u>Option 1:</u>

CHEM UN1403-UN1404 General Chemistry I and II	**8 pts.**
CHEM UN1500 General Chemistry Laboratory	**3 pts.**

CHEM UN1403-UN1404 General Chemistry I and II (Lecture), ***4 pts each.*** **Prerequisites: For 1403:** concurrent registration in *MATH UN1101*; for *UN1404: CHEM UN1403*. 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 UN0001 before taking UN1403. 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 UN1403 and UN1404 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 UN1500 General Chemistry Laboratory *3 pts.* Corequisites: *CHEM UN1403 or UN1404*. Laboratory Fee: $160. An introduction to basic techniques of modern experimental chemistry, including quantitative procedures and chemical analysis.

Option 2:

CHEM UN1604 Second Semester General Chemistry (Intensive)	**4 pts.**
CHEM UN1507 Intensive General Chemistry Laboratory	**3 pts.**
Or	
CHEM UN1500 General Chemistry Laboratory	**3 pts.**

Second Semester General Chemistry (Intensive) (CHEM UN1604) is appropriate for students who have an acceptable score on the placement exam or a B or better in Chem UN1403. 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 one-year Chemistry requirement for some medical schools. If you take this course but DO NOT have AP or IB credit, you may end up without enough Inorganic Chemistry credits for some medical schools.** Students who complete this sequence are still encouraged to go forward and take additional chemistry at the advanced level (biochemistry and/or other upper-level chemistry) so that they may strengthen skills and background and meet requirements for schools that are less open to accepting AP credit.

CHEM UN1604 Second Semester General Chemistry (Intensive) *4 pts.* Prerequisites: A grade of "B" or better in *CHEM UN1403* or acceptable performance on the Department placement exam. **Corequisites: UN1102 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 UN1507 Intensive General Chemistry Laboratory *3 pts.* Prerequisites: *CHEM UN1604* or *UN2045*. Laboratory Fee: $160. An introduction to basic techniques and practices of modern experimental chemistry, including qualitative procedures and chemical analysis. This course differs from *CHEM UN1500* in its emphasis on instrumentation and methods.

Option 3:

CHEM UN2045-UN2046 Intensive Organic Chem for First Year Students*	**8 pts.**
CHEM UN1507 Intensive General Chemistry Laboratory	**3 pts.**
CHEM UN2493-UN2494 Organic Chemistry Lab I and II**	**3 pts.**
Or CHEM UN2545 Intensive Organic Chemistry Lab	**3 pts.**

*This sequence begins in the spring.
**You must also register for the Organic Chemistry Lab Lecture course CHEM UN2495 and CHEM UN2496. Credits are attached to these course numbers.

Intensive Organic Chemistry is appropriate for students who have an acceptable score on the placement exam. Completion of this course with a grade of C or better will enable a CC or SEAS student to receive 6 credits of AP credit in Chemistry (if they scored a 4 or 5 on AP exam). **These AP**

credits are important to fulfill your one-year Chemistry requirement for some medical schools. If you take this course, but DO NOT HAVE AP or IB credit, you should plan to take additional, more advanced chemistry courses to round out your preparation for medical school. Students who complete this sequence are still encouraged to go forward and take additional chemistry at the advanced level (biochemistry and/or other upper-level chemistry) so that they may strengthen skills and background and meet requirements for schools that are less open to accepting AP credit.

CHEM UN2045-UN2046 Intensive Organic Chemistry for First-Year Students I and II (Lecture) *4 pts each.* Prerequisites: An acceptable grade on the placement examination given during new student orientation. Not open to students who have taken other courses in college-level chemistry. This course covers the same material as *CHEM UN2443-UN2444*, 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 UN2045-UN2046* are expected to enroll concurrently in *CHEM UN1507*.

CHEM UN1507 Intensive General Chemistry Laboratory *3 pts.* Corequisite: CHEM UN2045 or Prerequisite: *CHEM UN1604*. Laboratory fee $160. An introduction to basic techniques and practices of modern experimental chemistry, including qualitative procedures and chemical analysis. This course differs from *CHEM UN1500* in its emphasis on instrumentation and methods. The lab should be taken in the fall semester.

CHEM UN2493-UN2494 Organic Chemistry Laboratory *1.5 pts.* Prerequisites: *CHEM UN1500*. Corequisites: *CHEM UN2443-UN2443.* Laboratory Fee: $80 each term. Techniques of experimental organic chemistry, with emphasis on understanding fundamental principles underlying the experiments in methodology of solving laboratory problems involving organic molecules.

CHEM UN2545 Intensive Organic Chemistry Laboratory *3 pts.* Prerequisites: *CHEM UN2045* and *UN2046* and *UN1507*. Laboratory Fee: $160. The course covers the same material as *CHEM UN2493-UN2494* but is intended for those students who have taken Intensive Organic Chemistry for First-Year Students, *CHEM UN2045-UN2046*.

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 UN2443-UN2444 Organic Chemistry	**8 pts.**
CHEM UN2493-UN2494 Organic Chemistry Lab	**3 pts.**

CHEM UN2447-UN2448 Organic Chemistry (Lecture) *4 pts each.* Prerequisites: *CHEM UN1404* or *UN1604*, and *UN1500*. 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 UN2493-UN2494 Organic Chemistry Laboratory *1.5 pts.* Prerequisites: *CHEM UN1500*. Corequisites: *CHEM UN2443-UN2444.* Laboratory Fee: $80 each term. 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. Although you may receive AP credit for Biology, this does not place you out of this introductory class. We recommend all students take this course.

Option 1

Lecture:

BIOL UN2005 Intro to Biology I: Biochemistry, Genetics, and Molecular Biology 4 pts.
BIOL UN2006 Intro to Biology II: Cell Biology, Development and Physiology 4 pts.

BIOL UN2005 Introductory Biology I: Biochemistry, Genetics & Molecular Biology *4 pts.* Prerequisite: 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.

BIOL UN2006 Introductory Biology II: Cell Biology, Development & Physiology *4 pts.* Prerequisites: *EEEB UN2001* or *BIOL UN2005*, or the instructor's permission. Lecture and recitation. Recommended second term of biology for majors in biology and related majors and for premedical students. Cellular biology and development; physiology of cells and organisms.

Biology Lab Options:

BIOL UN2501 Contemporary Biology Lab 3 pts.

BIOL UN2501 Contemporary Biology Laboratory *3 pts.* Corequisites: Strongly recommended prerequisite or required corequisite: *BIOL UN2005 or BIOL UN2006.* Laboratory fee: $150. Enrollment limited to 24 students per section. Attendance at the first class is mandatory. Emphasis on experimental techniques and data analysis in a variety of biological disciplines.

BIOL UN2501 is the most common lab taken by premedical students, but students may also pursue other lab options. **The one semester laboratory is equivalent to a year of lab for medical school purposes.**

A student may also fulfill the laboratory requirement by taking:

- BIOL UN3040 Lab in Molecular Biology 3pts
- BIOL UN3052 Project Lab 5pts
- two terms of *BIOL UN3500* taken for 3 credits each and a letter grade, including the submission of a satisfactory research report*
- 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 UN3500* in the same laboratory (taken for 3 credits and a letter grade)*

Note: Biomedical Engineering students may fulfill their biology lab prerequisite with the completion of their BME labs.
Note: There is a difference between what fulfills the biology lab requirement for the Biology major and what meets the requirements for medical school. Please refer to this handout and not the biology department website for information regarding this requirement.
*Recently a small number of medical schools have indicated that independent research may not fulfill the biology laboratory requirement. So far, this hasn't become a widespread problem, but it is important for you to stay on top of the requirements at schools that you know will be on your list such as your state school(s).

Option 2

This option is appropriate for those students who are primarily interested in majoring in Environmental Science or Sustainable Development. This three course sequence will give prehealth students the background they need in cellular and molecular biology as well as the introduction to organismal biology and ecosystem that is foundational for the EEEB major. (Note: EEEB majors will NOT need to take EEEB 2001.)

Lecture:
BIOL UN 2005 Intro to Biology I: Cell Biology, Development & Physiology 4 pts.
BIOL UN2006 Intro to Biology II: Cell Biology and Physiology 4 pts.
EEEB UN2002 Environmental Biology I: Organisms to Ecosystems 4 pts.

EEEB UN2002 Environmental Biology I: Organisms to Ecosystems *4 pts.* Second semester of introductory biology sequence for majors in environmental biology and environmental science, emphasizing the ecological and evolutionary aspects of biology.

BIOL UN2005 Introductory Biology I: Biochemistry, Genetics & Molecular Biology *4 pts.* Prerequisite: 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.

BIOL UN2006 Introductory Biology II: Cell Biology, Development & Physiology *4 pts.* Prerequisites: *EEEB UN2001* or *BIOL UN2005*, or the instructor's permission. Lecture and recitation. Recommended second term of biology for majors in biology and related majors and for premedical students. Cellular biology and development; physiology of cells and organisms.

Lab:

BIOL UN2501 Contemporary Biology Lab 3 pts.

BIOL UN2501 Contemporary Biology Laboratory *3 pts.* Corequisites: Strongly recommended prerequisite or required corequisite: *BIOL UN2005 or BIOL UN2006.* Laboratory fee: $150. Enrollment limited to 24 students per section. Attendance at the first class is mandatory. Emphasis on experimental techniques and data analysis in a variety of biological disciplines.

BIOL UN2501 is the most common lab taken by premedical students, but students may also pursue other lab options. **The one semester laboratory is equivalent to a year of lab for medical school purposes.**

A student may also fulfill the laboratory requirement by taking:

- BIOL UN3040 Lab in Molecular Biology 3pts
- BIOL UN3052 Project Lab 5pts
- two terms of *BIOL UN3500* taken for 3 credits each and a letter grade, including the submission of a satisfactory research report*
- 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 UN3500* in the same laboratory (taken for 3 credits and a letter grade)*

Note: Biomedical Engineering students may fulfill their biology lab prerequisite with the completion of their BME labs.
Note: There is a difference between what fulfills the biology lab requirement for the Biology major and what meets the requirements for medical school. Please refer to this handout and not the biology department website for information regarding this requirement.
*Recently a small number of medical schools have indicated that independent research may not fulfill the biology laboratory requirement. So far, this hasn't become a widespread problem, but it is important for you to stay on top of the requirements at schools that you know will be on your list such as your state school(s).

PHYSICS
All SEAS students and any CC students interested in majoring 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 academic and career goals. Note: Students who want additional information about which sequence is best for their academic and career goals should attend the academic resource fair and discuss it with a departmental representative.

<u>Option 1</u>

PHYS UN1201-1202 General Physics	**6 pts.**
PHYS UN1291-1292 General Physics Laboratory	**2 pts.**

This option is designed to satisfy premedical physics requirements. It can be taken by all premedical students with the **exception of SEAS students, and those interested in majors or concentrations in Chemistry, Physics, Biophysics, Chemical Physics, and Astronomy.**

PHYS UN1201-UN1202 General Physics *3 pts.* Prerequisites: Prerequisite for PHYS UN1202: PHYS UN1201 The course will use elementary concepts from calculus. Students should therefore have some basic background in calculus or should be concurrently taking *MATH UN1101, Calculus I*. The accompanying laboratory is *PHYS UN1291-UN1292.* Basic introduction

to the study of mechanics, fluids, thermodynamics, electricity, magnetism, optics, special relativity, quantum mechanics, atomic physics, and nuclear physics.

PHYS UN1291-UN1292 General Physics Laboratory *1 pt each.* Corequisite: *PHYS UN1201-UN1202*. These courses are the laboratory companions for the corequisite lecture courses and should be taken during the same term as the corresponding lecture.

PHYSICS Option 2 – 4

2. PHYS UN1401-1402 Physics 6 pts.

This option is designed with SEAS physics requirements in mind and some CC students who are considering majors that would require a higher level of physics. (Note: SEAS students will take a third course in this sequence before taking the lab component.)

PHYS UN1401 Introduction to Mechanics and Thermodynamics *3 pts.* Corequisite: *MATH UN1101*, 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.

PHYS UN1402 Introduction to Electricity, Magnetism, and Optics *3 pts.* Prerequisite: *PHYS UN1401*. Corequisite: *MATH UN1102*, or the equivalent. Electric fields, direct currents, magnetic fields, alternating currents, electromagnetic waves, polarization, geometrical optics, interference, and diffraction.

3. PHYS UN1601 – 1602 Physics 7 pts.

This option is designed for Physics and Applied Physics majors.

PHYS UN1601 Physics, I: Mechanics and Relativity *3.5 pts.* Corequisite: *MATH UN1102* 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.

PHYS UN1602 Physics, II: Thermodynamics, Electricity, and Magnetism *3.5 pts.* Prerequisite: *PHYS UN1601*. Corequisite: *MATH UN1201* 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.

4. PHYS UN2801-2802 Accelerated Physics I and II 9 pts.

This option is an accelerated course intended for students with excellent preparation in calculus and introductory physics who intend to pursue a career in physics or applied physics. This is not a common option for premedical students but might be appropriate for someone who envisions working as a physician alongside a career doing research in involving physics or applied physics. (Note: this sequence does not have a lab. Premedical students who take this sequence should take the lab of their choice below to fulfil premedical requirements.)

PHYS UN2801-UN2802 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 UN1601*, *UN1602* and *UN2601*, 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 UN3081*, in the following year.

LAB OPTIONS

PHYS UN1291-1292 General Physics Lab	**2 pts.**
PHYS UN1494 Intro to Experimental Physics Lab	**3 pts.**
PHYS UN3081 Intermediate Laboratory Work	**2 pts.**

Any of these labs are adequate for fulfilling premedical requirements.

PHYS UN1291-UN1292 General Physics Laboratory *1 pt.* Corequisite: *PHYS UN1201-UN1202*. This course is the laboratory for the corequisite lecture course. It is best to be taken concurrently with the lecture.

PHYS UN1494 Introduction to Experimental Physics *3 pts.* Prerequisite: *PHYS UN1401, UN1402*, and *UN1403*. Laboratory work associated with the three prerequisite lecture courses. Experiments in mechanics, thermodynamics, electricity, magnetism, optics, wave motion, atomic physics, and nuclear physics.

PHYS UN3081 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 mathematics is not required by all medical schools, a number of schools require demonstrated competency in this area, often equivalent to one semester of calculus and one of statistics. Your choice of courses should be based on your background and your intended program of study – there are some majors which will require a year or more of calculus. Please consult the CC or SEAS Bulletin for more specific information.

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

Calculus Options:

MATH UN1101 Calculus I *3 pts.* Prerequisites: see Math Department: Calculus Classes. Functions, limits, derivatives, introduction to integrals.

MATH UN1102 Calculus II *3 pts.* Prerequisites: *MATH UN1101* or the equivalent. Methods of integration, applications of the integral, Taylor's theorem, infinite series.

MATH UN1201 Calculus III *3 pts.* Prerequisites: *MATH UN1101* with a grade of B or better or *Math UN1102,* 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.

Statistics Options:

The Department of Statistics offers three elementary survey courses, STAT UN1001 (Introduction to Statistical Reasoning), UN1101 (Introduction to Statistics - without Calculus), and UN1201 (Introduction to Statistics - with Calculus). STAT UN1001 is not focused on mathematical problem-solving and so is likely not the best to meet the requirement and therefore we'd recommend that you consider one of the other introductory courses. The best course for preparation for a future in medicine is probably STAT UN1101. Some engineering students have a statistics course required for the major. These courses should also meet the prerequisite requirement.

STAT UN1101 Introduction to Statistics (without calculus) *3 pts*. Prerequisites: Intermediate high school algebra. Designed for students in fields that emphasize quantitative methods. Graphical and numerical summaries, probability, theory of sampling distributions, linear regression, confidence intervals and hypothesis testing. Quantitative reasoning and data analysis. Practical experience with statistical software. Illustrations are taken from a variety of fields. Data-collection/analysis project with emphasis on study designs is part of the coursework requirement.

STAT UN1201 Introduction to Statistics (with calculus) *3 pts.* Prerequisites: one semester of calculus. Designed for students who desire a strong grounding in statistical concepts with a greater degree of mathematical rigor than in STAT UN1111. Random variables, probability distributions, pdf, cdf, mean, variance, correlation, conditional distribution, conditional mean and conditional variance, law of iterated expectations, normal, chi-square, F and t distributions, law of large numbers, central limit theorem, parameter estimation, unbiasedness, consistency, efficiency, hypothesis testing, p-value, confidence intervals. maximum likelihood estimation. Satisfies the pre-requisites for ECON UN3412.

PSYC UN1610 Stats-Behavioral Scientists *3 pts.* Prerequisites: PSYC UN1001 or PSYC UN1010 Recommended preparation: one course in behavioral science and knowledge of high school algebra. Corequisites: PSYC UN1611 Introduction to statistics that concentrates on problems from the behavioral sciences.

BMEN E4110 Biostatistics for Engineers *3 pts.* Prerequisites: MATH V1202 and APMA E2101 Fundamental concepts of probability and statistics applied to biology and medicine. Probability distributions, hypothesis testing and inference, summarizing data and testing for trends. Signal detection theory and the receiver operator characteristic. Lectures accompanied by data analysis assignments using MATLAB as well as discussion of case studies in biomedicine.

IEOR E3658 Probability for Engineers *3 pts.* Prerequisites: Calculus. For undergraduates only. This course is required for the OR:FE concentration. This class must be taken during (or before) the third semester. Students who take IEOR E3658 may not take SIEO E3600 or E4150 due to significant overlap. Fundamentals of probability theory. Distributions of one or more random variables. Moments, generating functions, law of large numbers and central limit theorem.

IEOR E4150 Introduction to Probability and Statistics *3 pts.* Prerequisite: Calculus, including multiple integration. This course covers the following topics: Fundamentals of probability theory and statistical inference used in engineering and applied science; Probabilistic models, random variables, useful distributions, expectations, law of large numbers, central limit theorem; Statistical inference: point and confidence interval estimation, hypothesis tests, linear regression.

STAT GU4001 Introduction to Probability and Statistics *3 pts.* Prerequisites: MATH UN1101 and UN1102 or the equivalent A calculus-based introduction to probability theory. A quick review of multivariate calculus is provided. Topics covered include random variables, conditional probability, expectation, independence, Bayes' rule, important distributions, joint distributions, moment generating functions, central limit theorem, laws of large numbers and Markov's inequality.

STAT GU4204 Statistical Inference *3 pts.* Prerequisites: STAT GU4203, or the equivalent. Calculus-based introduction to the theory of statistics. Useful distributions, law of large numbers and central limit theorem, point estimation, hypothesis testing, confidence intervals maximum likelihood, likelihood ratio tests, nonparametric procedures, theory of least squares and analysis of variance.

PSYCHOLOGY

The MCAT contains a section entitled "Psychological, Social, and Biological Foundations of Behavior." This section emphasizes concepts physicians will need to know in order to serve the increasingly diverse patient population and to understand the impact of behavior on health. This MCAT section emphasizes that appropriate attention must be placed on learning about the social determinants of health and the human side of medicine. The majority of content in this section is drawn from introductory psychology concepts. A small portion is drawn from the field of sociology. While most medical schools have not named psychology as a specific prerequisite requirement, because of the MCAT, we recommend that students consider taking an introductory psychology course. The Science of Psychology (PSYC UN1001) is the course at Columbia that we have determined best covers some of the content on the MCAT. While we certainly encourage students to explore courses within the Sociology Department, there is no one course that we currently recommend. Many students may find that they can learn key concepts through self-study. For more information about the MCAT please see About the MCAT Exam

PSYC UN1001 The Science of Psychology *3 pts*. Enrollment may be limited. Attendance at the first two class periods is mandatory. Broad survey of psychological science including: sensation and perception; learning, memory, intelligence, language, and cognition; emotions and motivation; development, personality, health and illness, and social behavior. Discusses relations between the brain, behavior, and experience. Emphasizes science as a process of discovering both new ideas and new empirical results.

BIOCHEMISTRY

One semester of biochemistry is required by a growing number of medical schools. While our BIOL 2005-2006 sequence covers a lot of the foundational biochemistry concepts, most medical schools will not accept this in fulfillment of a biochemistry requirement. Additionally, a course in biochemistry will help prepare you for the MCAT.

BIOC UN3300 Biochemistry *3 pts.* Prerequisites: one year each of Introduction to Biology and General Chemistry. Corequisites: Organic Chemistry. Biochemistry is the study of the chemical processes within organisms that give rise to the immense complexity of life. This complexity emerges from a highly regulated and coordinated flow of chemical energy from one biomolecule to another. This course serves to familiarize students with the spectrum of biomolecules (carbohydrates, lipids, amino acids, nucleic acids, etc.) as well as the fundamental chemical processes (glycolysis, citric acid cycle, fatty acid metabolism, etc.) that allow life to happen. In particular, this course will employ active learning techniques and critical thinking problem-solving to engage students in answering the question: how is the complexity of life possible? NOTE: While Organic Chemistry is listed as a corequisite, it is highly recommended that you take Organic Chemistry beforehand.

BIOL GU4501 Biochemistry, I: Structure and Metabolism *4 pts*. Prerequisites: Introductory Biology I and II and one year of organic chemistry. Lecture and recitation. In this course, we will explore the basic biochemistry of iving systems and how this knowleddge can be harnessed to create new medicines. We will learn how living systems convert environmental resources into energy through metabolism, and how they use this energy and these materials to build the molecules required for the diverse functions of life. We will discuss the applicants of this biochemical knowledte to mechanisms of disease and to drug discovery. This course satisfies the requirement of most medical schools for introductory biochemistry, and is suitable for advanced undergraduates and beginning graduate students.

NOTE: The Chemistry Department is always designing new courses, some of which may cover topics in biochemistry. However medical schools that require a course in biochemistry are generally looking

for something that covers foundational concepts in the topic. Consult a prehealth advisor before assuming something will meet the requirement.

NOTE: As Columbia courses are not specifically designed nor taught to prepare students for any standardized test, including the MCAT, there may be some concepts or topics on the MCAT which were not covered in your courses. However, given the strong foundation and background that you will develop through coursework here, you will be able to pick up this additional content through self-study or through test preparation materials.

SPECIAL NOTES RELATED TO CURRICULUM

AP Credit:
Policies regarding the acceptance of AP credit in fulfillment of premedical requirements varies from medical school to medical school, and sometimes from course to course. Most medical schools will require applicants to take at least one additional college level course in the subject area should they receive AP credit for the course requirement.

Additionally, the AP policies at Columbia vary from department to department as they are the purview of the faculty in each field of study. Some departments do not grant credit until an advanced course has been completed successfully. Additionally, even though you may receive AP credit for an introductory level course, this does not necessarily mean a department will exempt you from a requirement for the major. In any case, AP credits are not awarded until the conclusion of the first year at Columbia.

The most common question surrounding AP credit and premedical requirements relates to Chemistry. Students who begin in either CHEM W1604 Second Semester General Chemistry (Intensive) or CHEM W3045-W3046 Intensive Organic Chemistry for First Year Students will receive 3 and 6 credits of AP respectively (provided they have a 4 or 5 on AP test and earn a C or better in the sequence). These students are however still encouraged to go forward and take additional chemistry at the advanced level (biochemistry and perhaps other upper level chemistry) so that they may strengthen their skills and background and meet requirements for schools that are less open to accepting AP credit.

***Barnard Courses*:**
It is permissible to take premed requirements at Barnard. It should be noted, however, that the Biology and Chemistry Departments in Columbia College may not accept the courses towards the major. Additionally, registration priority will often be given to Barnard students and so it may be more difficult to get into these courses. You should discuss this decision with your Advising Dean before making a decision. Also regarding the MCAT, Barnard's biology class may not contain enough biochemistry to adequately prepare you for the exam. If you choose to take Barnard's biology sequence, a biochemistry course might be even more essential for MCAT prep.

Also Barnard's Chemistry Department requires students to take prerequisite chemistry courses at Barnard before joining upper level courses. Thus it is not possible to take Organic Chemistry lecture or labs at Barnard, unless you took the General Chemistry sequence there as well.

You should have good reasons for taking courses at Barnard and if you elect a sequence at Barnard you should try to take the entire sequence for consistency. You should also consult prerequisite information for some Barnard sequences require that you have taken the Barnard specific prerequisites in order to be eligible.

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 Advising Dean or prehealth advisor.

Summer Courses

Columbia College:

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 however, not desirable to take premedical sciences over the summer if it can be avoided. 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, if you have not demonstrated the ability to take on high volumes during the regular academic year. Additionally, the summer is a great time to pursue other types of experiences like research or clinical exposure.

Again, please consult an adviser before taking required premedical courses during summer session. If it is decided that summer is the best route, you need not take the course at Columbia in order for it to fulfill prerequisites for medical school – just as long as you don't need this course for your major or to fulfill other requirements at Columbia.

School of Engineering and Applied Science:

The curriculum at **SEAS** can be very full and demanding, thereby leading you to want to take one of the required premedical courses during a summer term. 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 students 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.

Study Abroad:

Premedical students are absolutely encouraged to study abroad if this interests them. However, note that premedical courses should not be taken during study abroad programs. Some medical schools will not accept coursework taken outside of the United States in fulfillment of requirements and therefore we do not recommend taking these required courses while abroad. However, again, study abroad is a wonderful experience that offers many other benefits including cultural immersion. If you are interested in studying abroad, you should consult a premedical advisor so that you may carefully plan for this endeavor.

Postbaccalaureate Studies:
Not all Columbia students will know from the very start that medicine is where they want to end up. Some discover this part way through their undergraduate years or even after graduating. As a result, some students will finish their premedical coursework after graduating or enroll in a postbaccalaureate program that is specifically designed to allow one to complete the preparatory courses before application. These students may still take advantage of all of the advising services offered through Preprofessional Advising.

THE MCAT

The Medical College Admission Test (MCAT) is a standardized, multiple-choice examination, required for application to medical school in the United States and Canada. This exam attempts to assess the knowledge and skills necessary for success in medical school.

The test consists of four sections:

- Biological and Biochemical Foundations of Living Systems
- Chemical and Physical Foundations of Biological Systems
- Psychological Social and Biological Foundations of Behavior
- Critical Analysis and Reasoning Skills

Medical college admissions committees consider an applicant's MCAT scores as part of their evaluation of applicants' academic readiness for medical school.

As stated above, in order to be prepared to take the MCAT and meet medical school prerequisites, we recommend that students complete the following:

1 year of General Chemistry and General Chemistry Lab
1 year of Cell and Molecular Biology and Biology Lab
1 year of Organic Chemistry and Organic Chemistry Lab
1 year of General Physics and Physics Lab
1 semester of Biochemistry
1 semester of Psychology

Note: The timing of your MCAT depends on your application timeline. You want to take it no later than May of the year you plan to apply to medical school. If you plan to take one gap year, that is the May that you graduate. If you are attempting to go straight on to medical school after graduation, then you would be taking the MCAT no later than May following your junior year. Remember that the average age of an entering medical school student is almost 25 and in recent years over 90% of Columbia applicants have taken one or more gap years before applying to medical school.

The MCAT is 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 and resources. Whichever you decide, if you prepare as a full-time enrolled student, you should probably make some attempt to lighten your course and/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.

PROFESSIONAL COMPETENCIES (As defined by AAMC)

These areas of competency were first defined by the Innovation Lab, a group brought together by the AAMC to identify new ways to assess the personal competencies of applicants in the medical school application process. One of the first steps for this group was to define these competencies. They have recently been updated (2022-23) by the Committee on Admissions. The following is taken directly from the AAMC website

Commitment to Learning and Growth

Practices continuous personal and professional growth for improvement, including setting and communicating goals for learning and development; reflects on successes, challenges, and mistakes; pursues opportunities to improve knowledge and understanding; and asks for and incorporates feedback to learn and grow.

Cultural Awareness

Appreciates how historical, sociocultural, political, and economic factors affect others' interactions, behaviors, and well-being; values diversity; and demonstrates a desire to learn about different cultures, beliefs, and values.

Cultural Humility

Seeks out and engages diverse and divergent perspectives with a desire to understand and willingness to adjust one's mindset; understands a situation or idea from alternative viewpoints; reflects on one's values, beliefs, and identities and how they may affect others; reflects on and addresses bias in oneself and others; and fosters a supportive environment that values inclusivity.

Empathy and Compassion

Recognizes, understands, and acknowledges others' experiences, feelings, perspectives, and reactions to situations; is sensitive to others' needs and feelings; and demonstrates a desire to help others and alleviate others' distress.

Ethical Responsibility to Self and Others

Behaves with honesty and integrity; considers multiple and/or conflicting principles and values to inform decisions; adheres to ethical principles when carrying out professional obligations; resists pressure to engage in unethical behavior; and encourages others to behave honestly and ethically.

Interpersonal Skills

Demonstrates an awareness of how social and behavioral cues affect people's interactions and behaviors; adjusts behaviors appropriately in response to these cues; recognizes and manages one's emotions and understands how emotions impact others or a situation; and treats others with dignity, courtesy, and respect.

Oral Communication

Effectively conveys information to others using spoken words and sentences; actively listens to understand the meaning and intent behind what others say; and recognizes potential communication barriers and adjusts approach or clarifies information as needed.

Reliability and Dependability

Demonstrates accountability for performance and responsibilities to self and others; prioritizes and fulfills obligations in a timely and satisfactory manner; and understands consequences of not fulfilling one's responsibilities to self and others.

Resilience and Adaptability

Perseveres in challenging, stressful, or ambiguous environments or situations by adjusting behavior or approach in response to new information, changing conditions, or unexpected obstacles, and recognizes and seeks help and support when needed; recovers from and reflects on setbacks; and balances personal well-being with responsibilities.

Service Orientation

Shows a commitment to something larger than oneself; demonstrates dedication to service and a commitment to making meaningful contributions that meet the needs of communities.

Teamwork and Collaboration

Collaborates with others to achieve shared goals and prioritizes shared goals; adjusts role between team member and leader based on one's own and others' expertise and experience; shares information with team members and encourages this behavior in others; and gives and accepts feedback to improve team performance.

EXTRACURRICULAR OPPORTUNITIES 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 the best ways to balance their professional responsibilities and their personal lives. Some doctors will tell you it is the hardest thing they had to learn. College is not a bad time to start.

Your choice of extracurricular activities should be guided by your interests. There is nothing intrinsically better about a cultural organization, a literary society, or the football team. Depth of involvement and leadership in a few things rather than membership in many will probably be more meaningful, 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 in need (children, the elderly, and the unhoused) are appealing to medical schools, but so are activities that demand judgment, efficiency, organization, team work, leadership, and dedication. Do what suits you. When considering your activities, think about the professional competencies that have been defined by the AAMC. This might help to guide you in terms of ways to stretch yourself into areas that you have not yet developed or shown competency. For example, if all of your activities are solitary, a medical school may not have appropriate evidence to evaluate your social, interpersonal, or teamwork skills. Community work, or other activities where you are giving your time freely to aid others, may help a medical school to assess your service orientation. Since medicine is a service-related profession, demonstrating that you have a history of serving others is important. Community work also provides you with the opportunity to step outside of your comfort zone, interacting with people different from yourself, which might help you to develop cultural humility.

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.

Paid employment is also seen as an extracurricular activity. It is recognized that some students must work in order to help contribute to their college expenses. Although it would 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 work well with others. 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 are seen as specifically appropriate for premeds: clinical exposure and research experience.

Clinical exposure is an essential part of preparing for medical school. At some point before applying to medical school you must expose yourself to doctors, nurses, other healthcare providers, and patients at the site of healthcare delivery. There is nothing 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 well-suited for

medical care-taking. It is essential to find that out before going to medical school. Clinical exposure will also help you to demonstrate your commitment and knowledge of the field of medicine, including both the rewards and challenges.

There are a number of ways in which Columbia students can acquire clinical exposure. Probably the most convenient because of proximity is volunteering at Mount Sinai Morningside Hospital. It is close by, it's a teaching hospital, and it's accustomed to training prospective physicians at every stage of their education. 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: https://www.cc-seas.columbia.edu/preprofessional/health

There is a long-standing myth that research is of primary importance and that students "must do wet lab research" to get accepted into medical school. 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 research experience (whether bench or clinical) will help you to be a more literate reader of the current research. But an outside wet lab experience is not absolutely required for entrance into medical school. Medical school admissions deans will often say that they like to see that applicants have "exposed themselves to some methodology for producing new knowledge." They define this very broadly and thus it is not just limited to wet lab experience. A senior thesis in psychology or a summer doing clinical research would fulfill this expectation as well as lab research. The exception here is the student who 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 basic science 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.

A SAMPLING OF PREHEALTH-RELATED STUDENT ORGANIZATIONS

This list is just designed to give you a sense of what's out there to engage with – there are too many related organizations and opportunities 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.

Columbia ASDA Predental

The Columbia chapter of the American Student Dental Association is dedicated to providing outreach and resources for predental students.

CUEMS

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.

Science and Health Publications
Columbia University Science Journal. *Columbia Undergraduate Journal of Global Health. Columbia Science Review.*

CHARLES DREW PREMEDICAL SOCIETY
The Charles Drew Premedical Society is an organization that strives to guide, support and encourage premedical students, with a special emphasis on supporting those currently underrepresented in medicine.

THE APPLICATION PROCESS

The application cycle begins in late May and runs through the academic year with medical schools beginning instruction each year in July or August. Detailed instructions about the timetable and procedures are available for each new class, and there are required and optional meetings for all prospective applicants to help guide them through the entire process. The important points to bear in mind before that time are the following:

Premedical Advisors
During your first two years, you and your Advising Dean will work out a course plan, which includes the premed courses. In the fall or spring of your sophomore year, you will declare your major; at that time, you will be assigned an additional advisor in your department. It is highly advisable that you also meet regularly with a prehealth advisor in the Berick Center for Student Advising. You can do this at any time and as early as your first semester.

Premedical Advisory Committee Process

The Premedical Advisory Committee (PAC) process is designed to help prepare Columbia students and alumni to be successful applicants to health professional school. The Columbia Letter serves as an introduction of you to the medical schools, focusing on your academic journey at Columbia. Your individual letters of support are appended in full to your Columbia letter and the whole packet is uploaded to the centralized system on your behalf.

This Columbia Letter is written at an applicant's request and only after the applicant completes all aspects of the PAC process by the stated deadlines. The goal of the committee process is to support candidates through the entirety of their application cycle by providing guidance and advice as they cultivate and refine the various pieces of their applications. The committee materials assembled by candidates involve an essay that helps us understand your interest in and motivation for a career in the health professions, an account of your extracurricular activities, short answers about some of your specific postsecondary experiences, and a copy of your resume. Additionally, we ask you to list your potential recommenders and, eventually, the actual letters of recommendation are submitted to our office.

In December of each year Preprofessional Advising will hold an informational meeting for all students and alumni planning to apply to medical or dental school in the coming summer. After this meeting

where we discuss the PAC process, we open the PAC portal and prospective applicants submit their materials in February. Once an applicant submits the Premedical Advisory Committee materials they are assigned a premedical advisor. The assigned advisor will work closely with the applicant throughout the application cycle and will write their Columbia Letter.

Application Timing

Most students choose to apply to medical school after they have graduated from college. Although there are always individual reasons for this, it is true overall that slowing down your timeline a bit may make the process easier in many ways. Some of the reasons students take time between include: taking more time to explore the field of medicine and gather postgraduate work experience, needing more time to finish prerequisites, wishing to improve their records before applying, needing more time for MCAT preparation, wanting to achieve other goals before starting medical school, or simply because they would like a break before beginning the rigorous process of medical training. Today, the average entering age of matriculants is almost 25. Medical schools highly value the maturity that comes with experience in the world and therefore taking a gap year or two to grow in other ways outside the classroom may indeed enhance your candidacy.

Whatever the reason, it is always better to wait to apply to medical school until you are absolutely sure you are ready. It is too much work and too expensive to embark upon casually. Medical schools have absolutely no bias against older applicants, and in fact many schools prefer candidates with more life experience. Generally, students will present a much more impressive profile if they apply after getting some postgraduate experience. Columbia will, of course, continue to assist you in the application process whenever you choose to apply. In fact, over 90% of the applicants to medical school from Columbia each year have already graduated from college when they apply and take at least one year between college and medical school.

Columbia Outcomes

Medicine is a profession which remains fairly consistent in popularity. Over the past two decades we have experienced an increase nationally in the number of applicants to medical school, and these numbers remain extremely high. While the numbers ebb and flow, Columbia regularly sees a high percentage of its applicants accepted to medical school.

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, please visit: https://www.cc-seas.columbia.edu/node/442188