

# MOLECULAR, CELLULAR AND INTEGRATIVE BIOSCIENCES

## Joint Degrees

### Joint M.D./Ph.D. with the College of Medicine

Requirements listed here are in addition to requirements listed in GCAC-211 Joint Degree Programs (<https://gradschool.psu.edu/graduate-education-policies/gcac/gcac-200/gcac-211-joint-degree-programs/>).

#### Admission Requirements

Students interested in simultaneously pursuing an M.D. and Ph.D. degree must apply to the College of Medicine M.D. program using the national American Medical College Application Service (AMCAS) application system and indicate their intent to pursue the joint degree program. Admissions requirements and applications for admission for Penn State College of Medicine are available in the M.D. Program (<http://med.psu.edu/md>) section of the Penn State College of Medicine website. The College of Medicine M.D./Ph.D. Admissions Committee reviews applications and evaluates applicants for acceptance into both the M.D. and Ph.D. program. Students not accepted into the joint degree program can be referred to either the M.D. or Ph.D. program, depending on their qualifications and interests.

After the review committee has accepted an applicant to the joint degree program, s/he must apply and be admitted to the Fox Graduate School (<http://www.gradschool.psu.edu/prospective-students/how-to-apply/>) for admission to the graduate program. The general admission requirements for the Ph.D. degree are listed on the Admission Requirements tab.

Additional admission requirements for the joint degree are listed below:

- **Academic Achievement** - Applicants to our program generally have very strong grades and MCAT scores. In recent years, successful applicants have an average GPA of 3.75 and MCAT scores of 33-34. Applicants are not required to take the GREs.
- **Research Experience** - We are especially interested in students with a strong and sustained background in research. Students who have spent 1-2 years after graduation conducting research are strongly encouraged to apply. Alternatively, in-depth research experience as an undergraduate can suffice.
- **Recommendations** - We are especially interested in receiving letters of recommendation from faculty with whom you conducted research and who can comment on your passion and potential for research.
- **Goals** - Applicants must be able to clearly articulate the reasons for pursuing the joint degree.
- **International Students** - All qualified students are eligible to apply regardless of citizenship.

#### Degree Requirements

Students must fulfill all requirements for each degree in order to be awarded that degree, subject to the double-counting of credits as outlined below. Degree requirements for the M.D. program are listed on the M.D. Program (<http://med.psu.edu/md>) section of the Penn State College of Medicine website. Degree requirements for the Ph.D. degree are listed on the Degree Requirements tab.

During the first two years of medical school, the student conducts at least three research rotations. After successful completion of the first two years of medical school the candidate joins their dissertation lab in the MCIBS Graduate Program.

During the summer after the second year of medical school M.D./Ph.D. students take Step 1 of the United States Medical Licensing Examination (USMLE), which serves in lieu of the knowledge-based part of the qualifying examination for the MCIBS program. Successful completion of BMS 506A and BMS 506B, which is taken in the second year of medical school, with a grade of B or higher, meets the critical thinking and paper analysis requirement of the qualifying exam.

The Ph.D. committee of an M.D./Ph.D. student in the MCIBS program is formed upon entry into the dissertation laboratory. In addition to the general Graduate Council requirements for Ph.D. committees (<http://gradschool.psu.edu/graduate-education-policies/gcac/gcac-600/phd-dissertation-committee-formation/>), the committee must include at least two members of the MCIBS program Graduate Faculty and one M.D./Ph.D. steering committee member.

The MCIBS program will accept passing grades in the medical school courses SPM 711 (15 cr.) in lieu of 11 required credits for the MCIBS Core Required and Elective courses. The 11 required credits include:

| Code                    | Title                                                            | Credits   |
|-------------------------|------------------------------------------------------------------|-----------|
| <b>Required Courses</b> |                                                                  |           |
| MCIBS 503               | Critical Elements of Genetics and Molecular and Cellular Biology | 4         |
| MCIBS 596               | Individual Studies                                               | 1         |
| <b>Electives</b>        |                                                                  |           |
| BMMB 541                | Molecular Biology of Animal Development                          | 3         |
| BMMB 542                | Eukaryotic Cell Biology                                          | 3         |
| <b>Total Credits</b>    |                                                                  | <b>11</b> |

Because students in the M.D./Ph.D. program are being trained to combine research and medicine, most likely in medical schools, the MCIBS requirement for exposure to undergraduate teaching is waived. M.D./Ph.D. candidates are not required to take BIOL 593 (2 credits) or to be teaching assistants. The Emphasis Area requirement and the Quantitative Foundation Course requirement are also waived.

In addition to taking the required courses MCIBS 590 (2 cr.), MCIBS 591 (1 cr.), and MCIBS 592 (2 cr.), elective courses are selected in consultation with the student's dissertation adviser and Ph.D. committee, with guidance from the MCIBS emphasis area course lists and program chair. 6 credits of elective courses will be selected.

The M.D./Ph.D. candidate prepares a written comprehensive examination in the format of a grant application and gives an oral presentation of this proposal to their Ph.D. committee.

A dissertation must be prepared and defended by each M.D./Ph.D. candidate, as described on the Degree Requirements tab. In addition, M.D./Ph.D. students must have *submitted* a first-author manuscript before defending their dissertation. Before returning to medical school, the doctoral dissertation must be accepted by the Fox Graduate School.

The M.D./Ph.D. program requires that students have one first author peer-reviewed paper published based on their research accepted prior to completing medical school, and preferably accepted for publication prior to returning to the third year of medical school. At the discretion of the College of Medicine Vice Dean for Research and Graduate Studies, in consultation with the MCIBS Program Chair, the requirement for a first author publication prior to completing medical school may be waived. Examples of conditions that might warrant exemptions include:

- prolonged illness,
- mentor's relocation,
- mentor's reluctance to submit the student's work for publication,
- the student's project is published by another research group, or
- delays or challenges in the publication review process beyond the control of the student or dissertation adviser.

If a student decides not to return to medical school, or for some other reason is not able to complete the last two years of medical school, but they have successfully completed their Ph.D. dissertation and final oral examination and met all other degree requirements for the Ph.D. in MCIBS, they will be eligible to receive the Ph.D. The latter will be conferred after the student notifies the program that she/he wishes to withdraw from the M.D. program and completes all requirements for conferral of the Ph.D. degree.