

Department of Chemistry and Biochemistry

Frequently Asked Questions by Prospective Students and Parents

The following questions and answers are compiled from open house presentations and prospective student visits over the last few years. They are not listed in any particular order.

What majors are offered in your department?

Our majors focus primarily in two areas, with five specific degrees offered. The B.S. degree in Chemistry is a professional degree that prepares a student best for either working in industry or going to graduate school. It can be contrasted to the B.A. degree in Chemistry that requires one fewer chemistry course, and one fewer math course. This option is ideal for a student who wants to use chemistry as the preparation for work in business, law, or a health profession, or who needs more time in college to pursue a double major. Teaching Certification for high school chemistry is most easily combined with the B.A. degree, as there are significant education courses and school field experiences that are required in this major. It is possible, however, to combine the B.S. degree in chemistry with teaching certification if one brings in some college credit, or is willing to take a few summer school courses.

In a similar way, there are two options for Biochemistry. Biochemistry, by its very nature, is an interdisciplinary degree – with courses required in calculus, physics, chemistry and biology. The B.S. degree would be best as preparation for graduate study, work in industry, or for application to medical studies at highly prestigious and competitive programs. The B.A. degree, however, was designed specifically with pre-health professions students in mind. Courses necessary for admission into medical school and the MCAT are required in this major. However, there are fewer upper level biology and chemistry courses. This allows room in a student's schedule for perhaps the pursuit of a minor, or double major, or extensive study of a second language – something that will set a student apart from others when applying to medical school. Medical schools look for well-rounded students and a B.A. degree provides more time in a student's schedule for that to happen.

What is the best major for pre-med?

The best major for pre-med is one that you will enjoy studying for four years, and that fits your learning style. You can major in anything you want to as long as you take the prerequisite science courses, do well in them, do well on the MCAT and participate in a variety of activities to boost your overall file for medical school. You may be surprised to know that the highest acceptance rates into medical school are from humanities majors, not science majors at all.

Should you decide during college that medicine is not for you, it is important that you have chosen a major from which you can pursue another career option. That is why it is important to choose an area you enjoy, and to always consider this as a possibility.

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Do you have a degree in pharmacy?

Small schools like Messiah College do not have the resources to offer complete pharmacy programs. However, in the fall of 2010 an articulation agreement was signed between Messiah College and the University of the Sciences in Philadelphia for a combination Biochemistry B.A. / Doctor of Pharmacy degree.

A practicing pharmacist must hold a Doctor of Pharmacy degree in the United States. If enrolled from the beginning at a school that offers this degree, the program typically takes six years. Other students will try to take the first couple years of preparatory courses at a smaller school, like Messiah College, and then apply for admission into a Doctor of Pharmacy program. It is becoming increasingly uncommon for these students to be admitted, since at the larger schools, there are already plenty of students in the pipeline. Thus, many students begin with a Bachelors degree in Chemistry, Biology or Biochemistry and then proceed to the Doctorate of Pharmacy program. This is not always a bad choice, because a broad science background enables one to enter fields other than pharmacy. However, the total process will take at least eight years.

Our new articulation agreement shortens this to seven years. The student in this program will take his or her first three years at Messiah College, which may be just the kind of place you want for college. The prerequisites for pharmacy will be taken at Messiah College. Each year, the University of the Sciences will reserve two spots in its pharmacy class for Messiah College students that have met all the entrance requirements for their program and apply for their program. A couple courses taken in Philadelphia will transfer back to Messiah College to meet graduation requirements. At the end of this program, a student will have a B.A. in Biochemistry from Messiah College and a Doctorate of Pharmacy from the University of the Sciences in Philadelphia.

Can I fit in a study abroad program with a major in this department?

Students are increasingly interested in pursuing study abroad experiences. Here at Messiah College, we offer a number of January or May term cross-cultural experiences that fulfill a General Education requirement, and are easy to fit into one's schedule. Studying abroad for an entire semester requires more planning, but it can certainly be done.

If this is one of your goals for college, you should start talking to your advisor about it during your first year. This way you can arrange your courses so that you can anticipate a semester free of science courses in which it would work best to go abroad. It is difficult to get science courses for a chemistry or biochemistry major in a study abroad program. You may have to opt for taking a science course over the summer, perhaps calculus, physics or organic chemistry. These courses are commonly offered at community colleges and major universities over the summer. Another option that some of our majors pursue is to begin physics in the first year. This provides you with more flexibility down the road. While this may appear initially daunting to you, physics and engineering

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majors begin physics in their first year, so you would be in a class with many other freshmen.

It is important that you choose a study abroad program that offers courses that will fulfill Messiah College requirements, and that you haven't already taken those courses here at Messiah College before going abroad.

Through the following link, http://www.messiah.edu/academics/epicenter/Dept_Info.html, you can find a page for Chemistry and Biochemistry that lists specific study abroad programs that we feel provide the best selection of general education courses that will allow you to complete a number of requirements while abroad. This is certainly not an exhaustive list of what you might do, but one we have helped to compile given what we know about combining a major in our department with a significant study abroad experience.

What classes should I take in high school to prepare me for studying chemistry or biochemistry in college?

You should take four years of science and math. Taking a broad range of science courses, including physics, is more important than focusing on multiple years of chemistry. Some high school students find time in their schedules for two years of chemistry. However, don't do that at the expense of physics. Broad exposure will better prepare you for the range of science courses that are part of the majors in our department. Take four years of math as well, preferably at least through pre-calculus. All of our majors require at least one semester of calculus. All except the B.A. in Biochemistry require at least two semesters of calculus.

But I don't like math...

Chemistry has long been called the central science, because it relies on the foundations of mathematics and physics, and informs other fields such as geology and biology. Math is a critical part of all our programs. As a department, we are not one to help students avoid subjects that are challenging to them. We want to prepare graduates on par with others across the country, and that may mean pushing students to new levels. We want students to be the best they can be. You will find our faculty and your fellow students willing to help you along the way.

What about AP courses in high school?

Many students are able to take AP Chemistry in high school. Upon completion of the coursework, the AP test is typically administered. If you score a five on this exam, Messiah College will grant you credit for all of our typical first year chemistry courses, General Chemistry I and II. If you score a four, you can be granted credit for General Chemistry I. With a three, you will still be required to take all of our general chemistry courses.

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That said, college chemistry is not like AP chemistry, especially in the laboratory component of the course. Your advisor at Messiah College will want to have a conversation with you upon your arrival on campus to discuss whether you feel prepared to begin organic chemistry (typically a sophomore level course), or would really like the review and the additional laboratory experience offered in our general chemistry courses. This is really an individualized decision that you will want to make upon consultation with your Messiah College advisor.

What courses would I typically take my first semester?

A typical chemistry major will enroll in Calculus I and General Chemistry I during their first semester. (Some students, do, however, bring in calculus credit from high school.) A teaching certification major absolutely must register for these two courses, because their schedule is quite tight. A Biochemistry major should enroll in General Chemistry I and Molecular and Cellular Biology. It is recommended that a Biochemistry major also enroll in Calculus I, but this isn't absolutely critical because there is less math required in this major. Calculus I is offered in both the fall and spring semesters.

In addition, incoming students take our First Year Seminar course, a writing course and then up to two general education electives, perhaps communication, language, history or social science.

What if I struggle? What support services are available?

If you are finding your courses difficult at Messiah College, in particular your science courses, it is important that you seek help quickly. First, an advantage of attending a small school like Messiah College is that the faculty are very willing and very interested in helping you. All have office hours or open door policies that provide plenty of opportunity for one-on-one assistance. It is important, however, that you have worked hard and can come with specific questions.

In addition to this, we currently offer a supplementary instruction program for General Chemistry II, Organic Chemistry I and Organic Chemistry II. In this program, an upper level student provides three additional hours a week of problem-working recitation sessions. This student leader typically sits in on the course he is assisting so he knows what the professor expects. When students attend these sessions on a regular basis, the data suggests that course grades improve by almost an entire letter grade. However, just so you know, when students attend these sessions only before an exam, these students' grades are typically lower than the class average. Cramming is not an efficient way to learn chemistry. You must be working at it on a regular basis.

The college also staffs a "learning center" where one can go for individual tutoring sessions. The students chosen to tutor chemistry and biochemistry courses are chosen specially by us both for their scientific skills and their ability to help others learn. One can sign up for a specific time to get the help you need, or walk in as needed.

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What does a typical week look like for a chemistry or biochemistry major?

Most of the courses in the biology, chemistry, biochemistry, physics and math require three lecture hours a week. Calculus has a 1-hour lab in addition to that. Introductory biology and chemistry courses all have a 3-hour lab associated with the lecture. An incoming student will take most of their science courses on MWF morning, with labs two afternoons a week in addition to their general education courses.

So, a 14 hour first semester load with two science courses would include 12 hours of lecture a week, along with two 3-hour labs. A 17 hour first semester load (which is high for an incoming student) would require 15 hours of lecture a week, along with two 3-hour labs.

Somewhere along the line you will likely have a semester or two that include three lab courses. This doesn't occur often, but when it does, it will be a busy semester.

What about research?

If you are asking this question, you are on the right track. Undergraduate students in the sciences should be looking for programs that offer these opportunities. In our department, the faculty have active programs with dedicated laboratories for student / faculty research. There are 200, 300 and 400 level courses designated for research, in which a student can earn academic credit for time spent in the laboratory. Upper level students often begin their research projects with a 1-credit course in which they explore and then write a research proposal for the project they will be doing. This and three credits of research (about 9 hours a week) in the following semester can be used to fulfill the Honors Project requirements for students in the Honor's Program. In addition, many students pursue research over the summer months, and we have a number of scholarship programs that provide salary for students who do research in our department for that time.

An on campus research experience early on, for example, by the junior year, can provide the experience needed to be competitive for summer research programs at major research universities. These programs offer a different large scale research experience and are invaluable for students thinking about attending graduate school. An experience here first and a good recommendation from your research advisor are helpful in securing these competitive opportunities.

A variety of research projects are underway in our department. These include:

- Synthesis of Aspernigrin, a cytotoxic compound isolated from a marine sponge
- Isolation and identification of the bright orange pigment from the Jack-O'-Lantern mushroom
- Characterization of the heat-shock proteins that protect organisms from stress
- Characterization of DNA packaging in microbes that live in extreme environments

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- Unique mineral synthesis and characterization
- Synthesis of unique inorganic materials using a glow-discharge plasma
- Use of plants as biocatalysts for synthesis
- Ionic liquids as green solvents for organic reactions
- Development of chemically functionalized surfaces for potential sensor applications
- Investigation of surface binding effects on the order of liquid crystalline films