

Student Handbook

Department of Cell Biology & Neuroscience

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I. Introduction

Welcome, Students Interested in Cell Biology, Neuroscience or the Biomedical Sciences!

The Department of Cell Biology and Neuroscience is the home for two degree options. The Biomedical Sciences Option is designed to fulfill the requirements for admission to most medical, dental and other biomedical professional programs. Option 2 is the Cell Biology and Neuroscience Option, designed to prepare you for graduate programs and a biomedical or neuroscience research career. Both tracks give you the freedom to design your own curriculum with an emphasis on topics such as cell and molecular biology, neuroscience, anatomy and physiology, or developmental biology. The two options are detailed in the two checklists at the end of this document. These options are also described in MSU's On-line Catalog, and on the departmental home page (<http://www.montana.edu/cbn>).

All students who are eligible should apply for entrance into the **University Honors Program**. As an honors student you will have access to more rigorous core English and Communications courses, smaller classes, Honors residence halls, and a greater flexibility in your education. The honors program is outlined in the MSU Bulletin; or visit the honors program website at <http://www.montana.edu/wwwuhp/index.html>. Students must maintain a 3.0 GPA to remain enrolled in the honors program. To receive an honors degree requires a minimum cumulative GPA of 3.5.

II. Frequently Asked Questions

"How do I decide which option is best for me today?"

The secret is that changing options is not difficult, so today pick the one that best seems to fulfill your goals. This will give your time during your first year to visit individually with an advisor and determine if you should stick with that choice or change your mind.

"What is the difference between the two options?"

The **Biomedical Sciences Option** is designed to fulfill the course requirements for admission to most medical, dental, optometry, and veterinary schools. It may also be used to prepare for other professional programs, or for biomedical research or teaching careers.

The **Cell Biology and Neuroscience Option** is designed for students planning to attend graduate school or who are preparing for careers in biomedical or neuroscience research. It offers additional preparation in mathematics, physical chemistry and neuroscience. This option can also be used to prepare for professional programs, or for teaching careers, although students preparing for professional (e.g. medical) school admission should note that this curriculum offers only one semester of organic chemistry (most medical schools require a full year of organic chemistry).

The coursework differences are summarize in the chart at the top of the next page:

Differences Between The Two Options

| Biomedical Sciences | Cell Biology & Neuroscience |
|---|---|
| Freshman Year: MATH 170 (Survey of Calculus) | Freshman Year: MATH 181 and MATH 182 (Calculus and Analytical Geometry I and II) |
| Sophomore Year: CHEM 311 and 312 (Organic Chemistry I and II) | Sophomore Year: Either CHEM 311 and 312 OR CHEM 215, Elements of Organic Chemistry (Sophomore Year) and CHEM 301, Elements of Physical Chemistry (Junior Year) STAT 332 (Statistics for Scientists and Engineers) |
| | Junior Year: BIOL 313 (Neurophysiology) |
| Senior Year: 24 additional elective credits | Senior Year: 18 additional elective credits |

"Is it a big deal to change options or even majors?"

No, if you decide to switch options, you go to the Departmental Office in 513 Leon Johnson and fill out a Change of Majors card. It takes about 5 minutes. (If you make the regrettable decision to choose a major in another department, you may pick up the card in our departmental office and then take it to the departmental office for the new major!)

"What courses do I get to take my first semester?"

The typical freshman takes Biology 113-21st century Biology; Chemistry 131-General Chemistry I; a course that satisfies the Verbal Core requirement - we

recommend that you take CLS 101-College Seminar - and a math course. The two options have different math requirements; the Cell Biology and Neuroscience option requires that you take a year of Calculus; this means starting with Math 181, followed by Math 182; the Biomedical Sciences option requires that you take Statistics 216 and Math 170-Survey of Calculus. You should take Stat 216 first since it is a prerequisite for BIOL 213. Knowing statistics is a very important skill, so that if you take the year of calculus, it would be good to also take some statistics.

EXCEPTIONS:

"I am eligible to take English 121 fall semester."

Take it now in place of the verbal core; this course is very difficult to get into so take it when it is your turn. You can take the verbal core in the spring.

"I have Advanced Placement (AP) credit for English (640 for the Verbal SAT and 27 for the equivalent ACT portion)."

You will not need to take any English to get a degree from MSU; however many medical schools do not accept AP credit and require one or two semesters of English. I am in the Honors Program. You may substitute UH 201-Text and Critics for the verbal core and UH 202 for a humanities course the following semester. However, you must apply to the Honors Program and be accepted to enroll in these courses.

"It has been a long time since I had high school algebra; I think I need a refresher."

Take the math placement exam while you are here for Orientation. That will tell you which math course you are prepared to take. DO NOT PUT THIS OFF!!! You must be able to do algebra to pass Chem. 131. Don't just register for Chem. 131 and hope for a miracle. Get started on algebra this first semester. The sooner you master the math, the faster you will be able to get to the interesting courses.

"Which math course should I take?"

The sequence of courses designed to prepare you for Calculus is Math 103 Algebra I-> Math 105 Algebra II. Start where the math placement test says you should start. (Do not let someone talk you into taking Math 150!)

"Do I need math to study biology?"

Cell and molecular biology are heavily dependent on chemistry; you MUST understand algebra to pass chemistry.

"If I can't take Chem. 131 this semester, what should I take? "

Start on your University Core requirements. See your bright pink sheet for course choices or the core requirements in the Bulletin. Some core courses fulfill multiple core requirements. Taking one of them counts double and will help you satisfy your core requirements efficiently. Do not worry about Natural Sciences core; your chemistry and physics courses will fulfill that core.

"How will my schedule be altered if I can't take Chemistry this first semester? "

If you are in the Cell Biology and Neurosciences option or are interested in molecular biology or biochemistry, you will have to take chemistry during the summer or take an extra semester to get the degree. The hangup is that each chemistry course builds on the previous one; thus each is a prerequisite for the next one. The year-long organic chemistry course must be taken with Chem 311 in the fall and Chem 312 in the spring unless you take them in the summer. This can be a good option, but you must be forewarned that organic chemistry in the summer is a serious course, and a full semester will be crammed into 6 weeks! You should plan to focus all your efforts on the summer course during this period.

"What is this about an advisor? How do I know who my advisor is and where to find her/him? What is an advisor for?"

There are actually three sorts of advisors, departmental, pre-health profession, and crisis management types. Routine, university degree requirement advising can be taken care of through your departmental advisor.

"How do I find out who my departmental advisor is?"

Go to the main office for the Department of Cell Biology and Neuroscience at 513 Leon Johnson Hall. Check the door first—once the sheets of new students reach the office, Lisa Musgrave, the Advising Coordinator, assigns students to a faculty member. You can check with her to find out who your advisor is.

"Departmental Advisors (Advising Coordinators) are great for signing official forms, checking on departmental requirements, and sometimes, career advising; however, they are scientists, not health professionals. So, whom do I speak to if I want specific information on how to best prepare myself for my chosen profession?"

First check out the prehealth web site. If you still have questions, contact the Health Professions Advising Office (308 Leon Johnson Hall, 994-1670). It's wise to do this early on in your academic career; you do not want to find out as a senior that you should have taken some different courses. The pre-health professions advisor has all sorts of good advice. Also inquire on how to become a member of AED, a pre-health honorary organization. AED offers several helpful

services to better prepare you for your future. The pre-health advisor can give you advice on how to volunteer at hospitals and other health care settings. There are also counselors who can help you get through rough times (994-4531). If these occur, you should also speak to your departmental advisor about how to handle university issues, e.g. when to drop courses, what to drop, etc.

"Whew! I've gotten through the first few weeks and now they tell me I need to register for spring semester. How do I do that? "

First, you need something called a PDF, short for personal data form. There will be a notice in The Exponent when these are available. Go to the Departmental Office at 513 Leon Johnson to pick yours up, but remember THEY ARE NOT OPEN OVER THE LUNCH HOUR. You need the number in the upper right hand corner of the PDF. This is sometimes called your "advisor code." However, it is YOUR number! The advisor does NOT know it!! HANG ONTO this sheet because the advisor code and your PIN will allow you to access your records, allow you to register, and check your grades on the WEB.

"Wait a second, I also need to know what to take spring semester."

If you are following one of the Check lists at the end of this handbook and know which classes you intend to take, you can simply follow the directions in the Schedule of Classes to register either by phone or on the WEB (click on MyInfo from the MSU homepage), once you have picked up your PDF (Personal Data Form) from the department office. WEB registration is usually much faster and easier than using paper. If you don't know which classes to take, make an appointment to see your advisor and talk about your options. If you signed up for the four-year graduation guarantee, you must see your advisor before registering each semester to validate the guarantee. Advisors have other responsibilities including 30 to 40 other advisees, so do not expect to be able to walk in at your convenience and be helped immediately.

III. Advising Handbook to Accompany 2002–2004 Catalog for Biomedical Sciences Option Students

Pre-medical, Pre-Dental, or Pre-vet Students

Arrange university and departmental elective credits to include:

- Biol 311: Embryology or Biol 438: Developmental Mechanisms
- Biochem 441: Macromolecules or Biochem 442: Metabolism
- English 223: Technical Writing, or English 221: College Writing II
- US 102 (Section 2): [formerly Gens 102] Career Connections: Health Professions
- Phil 105: Problems of Good and Evil

- Phil 338: Biomedical Ethics
- Psych 100: Plus an additional three credits of Psychology
- Soc 400: Seminar on Biomedical Issues

Courses to consider to strengthen background:

- Biol 410: Dissection Anatomy
- Biol 411, 412: Vertebrate Physiology
- Pre-Dental Students Should Also Take:
- Meds 270: Intro to Dentistry
- Biol 312: Histology

Pre-Vet Students Should Also Take:

VMB 271: Anatomy of Domestic Animals

Pre-Vet students should also work with the pre-vet advisor in the Department of Veterinary Molecular Biology

Pre-Optometry, Pre-Physical Therapy, or Pre-Pharmacy Students

Arrange university and departmental electives to include:

- Biol 207: Human Anatomy and Physiology I
- Biol 208: Human Anatomy and Physiology II
- Pre-Physical Therapy Students Should Also Take:
- Biol 411, 412: Vertebrate Physiology
- HDPE: Exercise Physiology
- HDPE: Biomechanics

Pre-Pharmacy Students Should Also Take:

- Psych 100: Intro. Psychology
- Econ 101 or 102: Intro Economics
- Anatomy and Physiology Focus in Biomedical Sciences
- Arrange university and departmental elective credits to include:
 - Biol 207: Human Anatomy and Physiology I
 - Biol 208: Human Anatomy and Physiology II
 - Biol 310: Vertebrate Anatomy
 - Biol 311: Histology
 - Biol 312: Embryology
 - Biol 313: Neurophysiology
 - Biol 410: Dissection Anatomy
 - Biol 411-412: Vertebrate Physiology

IV. Mastering College: Grades, Resumes, entrance to medical and other professional and graduate schools.

“What sort of grades will I need to get into medical school?”

You will be entering fields, by virtue of their attractive natures, where entrance is highly competitive. Most of you know that a high grade point average is a necessity, usually a 3.7 or above is sufficient. You will also be taking some sort of test to gauge your ability to think and apply the concepts you learned in your classes (e.g. GRE, MCAT). There is a common problem that you should address from day one: do not settle for merely getting an A; learn the material; you do not want to be relearning acid-base chemistry before the MCAT. Thus your attitude should be to focus on learning, and let the grades be secondary. Those who teach MCAT review courses, often hear too many times, "I wish I had learned that the first time." Also, to apply scientific concepts to novel questions, which is the manner in which you will be tested during entrance tests, it is useful to be absolutely fluent in scientific concepts. You will also find that being an A+ student is a far more enjoyable experience than any other; it means that there is never any anxiety associated with tests, and that you are understanding everything the professor says. Being lost is not a feeling enjoyed by anyone.

“I want to be a scientist. What should I be doing?”

If your plan is to become a scientist, it is good to get started right away. Check out the department website and look for faculty members that are doing research that interests you. Before you visit a laboratory, check to see if you can get work-study funding. It is often easier for faculty to create spaces for students with work-study funds. Research stipends are also available through the MSU Undergraduate Scholars Program (USP). Then approach the professor about working for him/her.

Also check out research interests in related departments, e.g. microbiology, veterinary molecular biology, and chemistry and biochemistry. See <http://www.montana.edu/level2/colleges.html>

“Ok, so now I realize that I will have to learn a lot more thoroughly than I did in high school; but how do I do that?”

There are a lot of study techniques out there. The following are some that we highly recommend. Want phenomenal success? Do them all!!!

- Read ahead of lecture. This will make you think hard about the material on your own, as well as familiarize you with the language and some of the more difficult topics which can be hard to understand during lecture. Few of us are so smart that we can understand college level material for the first time, and simultaneously take notes on the material.

- While reading, at the end of each paragraph or page, ask yourself if there was anything presented that was worthwhile, something you need to remember, either a concept or fact. If there was, write a question that will test you on that item, and write the proper answer to it. This can be done easily by drawing a line down a regular sheet of paper and placing questions on the left and answers on the right. You can then use this as a study guide by covering up the answers and quizzing yourself. You should do this before class, and several times a week until you know the material solid. It is important to put the question in your own language; copying is useless
- While reading try to convert ideas into sketches; use sketches in your study guides.
- Do as many practice problems as possible, especially in physics and chemistry. These usually reside at the end of book chapters; and the answers are in the back (if they are not, ask your professor for answers).
- Professors like to talk to students, if it is about ideas and concepts. Professors do not like to talk about grades, tests, etc. They dislike these things even more than you do.
- Try to maintain a good attitude about the course and the ideas within it. If possible, think how some of them apply to your life. Also try to keep positive about yourself, especially when looking at silly mistakes made on tests. This happens to everyone, and is not serious within a certain range.

"Why do certain study methods work?"

How much you learn is directly related to the quality and amount of hard thinking work that you put into your preparation. The key is to incorporate thinking into every aspect of your studying. Your brain is likely to make new connections/memory if you do this work; however, if your efforts are more passive, then the depth of learning and quantity of material remembered will not be sufficient. It is the actual thinking that you do that fosters understanding and memory; more passive efforts will not lead to deep understanding of the material.

This thinking goes on when you discuss the material with study partners or when you just daydream about your body and relate it to your studies. It happens as you read -- if you are critical of what is being said, if you make certain that what you are reading makes sense. If you take the author for granted, assume he or she knows what they are talking about, there will be less learned. It will also occur when you convert reading material into something else, for instance, drawings or relationship maps. The current belief amongst researchers is that memories are made of a vast net of connections spreading across diverse areas of the brain. Using and manipulating new pieces of information will ensure that the memory nets you make are strong, and more importantly, this knowledge is likely to be accessible, to be used in creative ways when needed.

Since thinking about the material is the crucial step in learning, then it is possible to go to class, read the book, do the homework, and do poorly in a class, if all these are done passively. However, if done with an alert and focused mind, one learns a lot and the class becomes easy. I have seen homework in which material is copied from the book; this is a waste of time. It is merely copying, and can be done in a semi-conscious state; you must convert things into your own words, and after some time away from the original source, so the words come out of your own ideas. As you reread them, do so critically; make sure your arguments are persuasive; make sense.

"How should you view lecture? "

Lecture classes are often large, and there is a huge amount of material to cover; thus, the professor cannot create a dialogue in lecture that forces everyone to think out each concept to be learned. Lecture can be many things; it tells you where to concentrate your efforts; it can make things interesting; it is another explanation of the ideas that you can contrast to your own view of the material. Here are two quotes from famous education researchers on this matter:

"All genuine learning is active, not passive. It is a process of discovery in which the student is the main agent, not the teacher." (Adler, 1982).

"Learning is not a spectator sport. Students do not learn much just by sitting in class listening to teachers, memorizing pre-packaged assignments, and spitting out answers. They must talk about what they are learning, write about it, relate it to past experiences, apply it to their daily lives. They must make what they learn part of themselves." (Chickering and Gamson, 1987).

Thus, while the burden for your education rests on your shoulders, this view also rightly places all responsibility for successes onto those same shoulders. The B student is constantly in pain; class is rarely fun. In contrast, the A+ student enjoys class, he/she knows everything, there is no stress on tests, and his/her future is relatively secure. Being an A student is the far easier and more enjoyable way to go through college; and is highly recommended. The triangle at right shows the level of retention gained by various methods of learning.

Learning is a very complicated process, and each of us learns better in some ways than others; so be sure to give yourself every advantage. You should definitely draw diagrams to show the relationship between things, and draw pictures of structures etc. Drawing and sketching require you to convert words into pictures which forces your brain to think in unique ways and also affords you with a visual image in case you are a visual learner, like many of us are.

There are a few more study aids often available. Professors will often post tests from previous years in the library, Cards and Copies, or on the WebCT course site, if your course has one; use these resources well. You might also look at the chapter summaries and review questions at the end of each chapter of your textbook.

Prior to each test you should review all your study guides until you are certain that you know everything in them completely, and you should review any old tests. Homework or test questions that gave you problems the first time should be repeated.

Lastly, the night before the tests, professors often give a review session. You should come to this to see what questions fellow students want answered; see if the answer that develops in your mind matches that of the professor.

By learning effective study techniques, you will make your college career one of the most enjoyable times of your life. It allows you to succeed and enjoy very difficult courses, which will boost your self-esteem and make you a far more effective person, one well on the way to success in your chosen profession. Excelling at each level of your schooling keeps your options open; it allows you to choose your own course through life.