GRADUATE STUDENT HANDBOOK

DRUG DISCOVERY AND DEVELOPMENT (DDD)
GRADUATE PROGRAM TRACK

PHARMACEUTICAL SCIENCES
Ph.D. DEGREE
This handbook outlines the philosophy and requirements of the Graduate Degrees offered in the discipline of Pharmaceutical Sciences, Drug Discovery and Development Track, at the University of Arizona. It is intended to be used as a tool to understand the requirements for obtaining a graduate degree. This handbook should be used in conjunction with the current Graduate College Catalog. The requirements of the Graduate Program Track in Drug Discovery and Development outlined herein are under the authority of and consistent with the rules and guidelines set forth by the Graduate College of the University. Some of our curricular requirements exceed those stated in the Graduate College Catalog. Students must meet the more stringent requirements contained in this handbook. Certain general University regulations and specific Drug Discovery and Development Track degree requirements are only outlined in this document; consult the current Graduate College website for policies and guidelines set forth by the Graduate College and Graduate Council: https://grad.arizona.edu/new-and-current-students

Attainment of a graduate degree in Pharmaceutical Sciences requires outstanding scholarship and demonstration of distinguished research leading to a thesis/dissertation that contributes significantly to the general body of knowledge in the discipline. The degrees are never granted solely as certification of faithful performance of a prescribed program of study. All degree requirements must be fulfilled. Therefore, the requirements for these degrees are also outlined in this Handbook.
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INTRODUCTION

The Drug Discovery and Development Track of the Graduate Program in Pharmaceutical Sciences offers well-funded research opportunities, and the strong multidisciplinary nature of the program provides students with a highly interactive approach to research and education in Drug Discovery and Development.

Master of Science (M.S.) Degree in Pharmaceutical Sciences
The Drug Discovery and Development Track of the Graduate Program in Pharmaceutical Sciences does not admit students with the expressed interest in pursuing the M.S. degree. For a variety of reasons, students admitted to the Ph.D. Program may complete an M.S. degree (non-thesis option) alongside or in lieu of a Ph.D. degree. These reasons may range from unsatisfactory academic performance in the Ph.D. program to a desire to make a course correction in career path. The overall expectations for these students are similar to those for students in the Drug Discovery and Development Ph.D. program.

Doctor of Philosophy (Ph.D.) Degree in Pharmaceutical Sciences
The Drug Discovery and Development Track of the Graduate Program in Pharmaceutical Sciences offers a Ph.D. degree in pharmaceutical sciences. Students in this program must take courses in the major area as well as one of the several possible minor areas of study.

The objective of the Drug Discovery and Development Track is to impart advanced scientific knowledge in the drug discovery and design phases of pharmaceutical development, and to provide training opportunities in conducting state-of-the-art approaches in basic research in pharmaceutical sciences, and closely related sub-disciplines, in order to prepare the students for careers in independent research or related careers in academia, industry or government. The average time to graduation is less than five years.

Drug Discovery and Development Option in Biological Chemistry Program
Students in the College of Pharmacy’s Drug Discovery and Development Track have the option of participating in the Biological Chemistry Program T32 Training Grant at the University of Arizona.

Many of the most exciting research opportunities today are at the interface of biology and chemistry. The Biological Chemistry Program offers an opportunity for the interdisciplinary study of molecules in living systems that integrates the traditional disciplines of chemistry and biology.

The Biological Chemistry Program consists of faculty and students from three departments that have joined together to provide this graduate education. The cross-discipline structure allows for students to explore interests that may not be confined to one graduate program. The Program is supported by a training grant from the National Institutes of Health. Visit the Biological Chemistry Program website for information about the program’s requirements, faculty, and application process (http://www.biochem.arizona.edu/bcp/Intro.html).

1.1 BACKGROUND

Drug Discovery and Development is an interdisciplinary program involving many aspects of chemistry and molecular biology, ultimately associated with intellectual property and clinical trials. As such, Drug Discovery and Development is a critical component of the drug discovery, design, and development pathway. No longer is the medicinal chemist just the synthetic chemist who synthesizes a range of compounds in the hope that one of them will turn out to be a lead compound for development. He or she has a firm basis in chemistry that may be focused in organic synthesis, computational chemistry, or one of the allied chemistry disciplines, but also has familiarity and overlap with chemical biology, structural biology, pharmacology, pharmacokinetics, toxicology, regulatory science, and intellectual property management. At the University of Arizona, our drug discovery and development faculty have a variety of expertise, such as synthetic medicinal
chemistry, structure-based design, molecular modeling, phenotypic screening, and molecular and cellular biology. The Drug Discovery and Development Program and its students have participated in drug discovery programs leading to clinical trials of agents in a number of therapeutic areas, including cancer and cardiovascular diseases.

Research in Drug Discovery and Development operates at the interface of chemistry and biology. It requires a broad perspective in science and typically involves interactions with chemists, botanists, pharmacologists, and clinicians. Drug discovery and quality control may require further contacts with business leaders, lawyers, intellectual property rights specialists, and government and non-government officials. Thus, Drug Discovery and Development offers many challenging opportunities in both basic and applied research.

The role of Drug Discovery and Development in the health-related sciences is evidenced by the increased need for highly trained professional personnel (M.S., Ph.D. degrees). This need is reflected in the number of positions available in research/teaching/service areas of health professional schools (of human medicine, pharmacy), university undergraduate and graduate programs, pharmaceutical and chemical industries, hospitals, and state and federal government research and regulatory agencies.

The Graduate Program Track in Drug Discovery and Development at the University of Arizona is oriented toward modern areas, especially those areas dealing with the discovery and development of drugs from natural resources. Current research of the participating faculty members in the Program include investigations in the fields of cancer chemoprevention, natural products chemistry, antioxidant chemistry, drug design and synthesis, molecular graphics, and the application of NMR and mass spectrometry to biomedical problems.
2.0 THE GRADUATE PROGRAM ORGANIZATION

2.1 PHILOSOPHY AND GOALS

A primary mission of the Drug Discovery & Development Track within the Pharmaceutical Sciences Graduate Program is to graduate outstanding scientists who will make strong contributions to the education of future pharmaceutical scientists and to the discovery and design of increasingly effective pharmaceuticals, while at the same time appreciating the other aspects of pharmaceutical development. Related to that, our mission is to contribute to the body of knowledge through scientific research.

2.2 GRADUATE COUNCIL FOR GRADUATE PROGRAMS

The Graduate Council in the Department of Pharmaceutical Sciences for Graduate Programs in the College of Pharmacy is comprised of one voting faculty member from each of the program tracks, one non-voting program coordinator, and a non-voting graduate student representative from each program track. The Council formulates policies and coordinates activities of the graduate program for all disciplines within the College of Pharmacy, including the Drug Discovery & Development track. This council is charged with the overall evaluation of graduate student performance and also makes final decisions concerning applicants for admission to the program. The student representatives are not included in the evaluation of student performance or admitting students into the program.

The council is also charged with overseeing all curriculum matters. A chart of the organizational structure of the graduate tracks that are housed within the College of Pharmacy is shown below.

2.3 GRADUATE TRACK EXECUTIVE COMMITTEE ON DRUG DISCOVERY AND DEVELOPMENT

The Executive Committee on Drug Discovery and Development consists of voting faculty members and one non-voting program coordinator. The Council formulates policies and coordinates activities of the Drug
Discovery and Development Program, evaluates and selects applicants for admission to the Program, and considers curriculum matters.

2.4 PARTICIPATING FACULTY
The following is a list of full DDD Graduate Program Faculty with whom students may pursue their research. In addition, faculty associated with the Biological Chemistry Graduate Training Program (BCP) can serve as primary advisor to those DDD graduate students who are members of BCP.

2.4.1 DDD GRADUATE TRACK CORE FACULTY

**Eli Chapman, PhD, Assistant Professor, Drug Discovery and Development**
Our lab is a chemical biology lab that is focused on a number of disease states with a primary emphasis on cellular quality control pathways, such as proteostasis and redox homeostasis. We use chemistry, biochemistry, biophysics, structural biology, and cell and molecular biology to discover and develop targeted protein modulators.

**Chris Hulme, PhD, Professor, Drug Discovery and Development**
Discovery and development of novel neurodegenerative therapeutics; high-throughput Medicinal Chemistry and the development of novel chemistries with iterative efficiency to expedite the drug discovery process; Microwave Assisted Organic Synthesis (MAOS) and Multicomponent reactions (MCRs).

**Rick Schnellmann, PhD, Dean and Professor, Drug Discovery and Development**
Identifying and developing drugs to treat acute kidney injury, diabetic kidney disease, stroke, spinal cord injury and Parkinson’s disease through mitochondrial biology.

**Daekyu Sun, PhD, Associate Professor, Drug Discovery and Development**
Discovery and development of a new therapeutic strategy to repress the transcriptional activation of the human VEGF, HIF-1α gene, RET, and other oncogenes with small molecules capable of binding selectively to non-canonical DNA structures formed within the promoter region of this gene; Study of the mechanism of action of novel anticancer agents derived from natural products: Investigation of DNA-repair interference as a potential approach for cancer treatment.

**Jun Wang, PhD, Assistant Professor, Drug Discovery and Development**
My lab is interested in developing antiviral drugs and elucidating their mechanism of action as well as resistance mechanism. We are exploring both small molecule and miniprotein-based therapeutics to target either viral proteins or host factors that are essential for viral replication. Targets of particular interest include ion channels and protein-protein interactions. We implement a wide variety of techniques for these studies including assay development (target-based and phenotypic-based), computational screening, medicinal chemistry, structural biology, virology, and in vivo animal models. The goal is to identify first-in-class drug candidates for emerging and re-emerging viruses such as influenza, enterovirus, zika and dengue viruses.

**Wei Wang, PhD, Professor, Drug Discovery and Development**
My research aims at exploring innovative and useful chemical tools to address important and challenging biological questions in drug discovery and chemical biology. Toward this end, we take two approaches: 1) develop sustainable synthetic strategies including cascade reactions and organocatalytic and photochemical transformations to navigate new chemical space for drug discovery and 2) design functional molecular probes to understand the mechanism of action of proteins and spatiotemporally control cellular functions.

**Georg Wondrak, PhD, Associate Professor, Graduate Program Track Director, Drug Discovery and Development**
My research examines the pathological role of oxidative and proteotoxic stress in solar photodamage and melanoma/nonmelanoma skin cancer aiming at the design of novel molecular strategies for chemotherapeutic and/or cytoprotective intervention.
2.4.2 **DDD Graduate Track Associate Faculty, COP**
Faculty from other COP graduate tracks (Pharmacology & Toxicology and Pharmaceutics) can serve as major advisor of DDD graduate track students after approval by the DDD Executive Committee.

2.4.3 **DDD Graduate Track Associate Faculty, BCP**
Faculty associate with the BCP Program can serve as major advisor of DDD graduate track students after approval by the DDD Executive Committee.

2.5 **Graduate Student Representatives**
Graduate student representatives are elected by the graduate student body of the Program Track in Drug Discovery and Development for two-year terms. The representatives serve as an official liaison between the students and faculty of the Program. The representatives are responsible for organizing graduate student participation in Program endeavors, as well as serving on Program committees in an advisory capacity. Each student should seriously consider his/her choice for the graduate student representative(s) in order to maintain an effective student voice in Program issues.
3.0 PHYSICAL RESOURCES AND FACILITIES

3.1 LABORATORY SPACE

The faculty and graduate students in the Drug Discovery and Development Program occupy space in the College of Pharmacy, the University of Arizona Arizona Cancer Center UACC, and the BIO5 building. This distribution of labs in three different locations is a reflection of the interdisciplinary nature of the program. Drug Discovery and Development’s weekly seminars are held in the College of Pharmacy, and there are organized social events to bring faculty and students together periodically.

3.2 EQUIPMENT RESOURCES

Availability of modern scientific instruments is crucially important to research and graduate education programs. We are fortunate to possess ample instrumentation to conduct research at all levels of biological organization. Each investigator’s laboratory is equipped with specialized instrumentation required for research in their particular field.

Drug Discovery and Development laboratories are especially well endowed with instruments necessary for modern Drug Discovery and Development, including high-field NMR, molecular graphics, mass spectrometers, and high-performance liquid chromatographs. All laboratories have access to modern computers and data processing systems.

3.3 LIBRARY RESOURCES

The University of Arizona takes pride in the outstanding quality of its libraries. UA Libraries are made up of the Main Library, Science-Engineering Library, Fine Arts Library, and Health Sciences Library and they hold extensive collections of periodicals, monographs and special collections.

The Health Sciences Library http://ahsl.arizona.edu/ is located at the Arizona Health Sciences campus. It is the largest, most comprehensive health sciences library in Arizona. In addition to its holdings of pertinent health sciences periodicals and monographs, the library provides an excellent array of valuable services including bibliographic searches, librarian consults, and research support. The Health Sciences Library provides access to essential medical information, and specialized databases such as Embase, the world's largest database of drug information. Librarians participate as instructors in the curriculum of the health sciences colleges, and work in partnership with researchers and clinicians to advance health information literacy. The library also provides spaces for small group collaboration and quiet study.

3.4 RESEARCH COMPLIANCE TRAINING

The following research compliance programs provide training and support to help University of Arizona researchers including graduate students comply with and navigate the various federal, state, and local regulations that govern research conduct. Please consult the following page: https://rgw.arizona.edu/research-compliance/training

3.4.1 LABORATORY SAFETY AND ENVIRONMENTAL HEALTH

Students are required to attend courses on these topics by the end of their first semester of residence, preferably as soon after their arrival as possible. It is the responsibility of all personnel involved in scientific study to be aware of the safety precautions and the proper disposal of hazardous wastes specific to the research effort. The student has a moral obligation to not only familiarize him/herself with, but also follow, the specifics of laboratory safety associated with his/her desired area of research. The offices of Risk
Management and Radiation Control offer seminars covering such subjects as fire prevention, hazardous waste disposal, compressed gas safety, basic radiation protection, industrial hygiene, etc. Laboratory directors and technicians are the best source for day-to-day laboratory safety techniques and advice on safety seminars required for laboratory personnel.

3.4.2 University Animal Care

The availability of high quality experimental animals is of great importance to modern research in pharmacology and toxicology. Graduate students MUST become familiar with safe and humane animal care and handling techniques. The University Animal Care Facility procures and cares for all animals used in teaching and research by the Program. The staff of University Animal Care is available to students for consultation on problems related to the use of animals in scientific research at:
https://rgw.arizona.edu/compliance/IACUC

3.5 Poison Control Center

The College of Pharmacy is responsible for the operation of a State-wide Poison Control and Drug Information Center; these facilities are located in the Health Sciences Center Library. Faculty and fellows in Clinical Pharmacology provide expert advice and consultative services for these centers.
4.0 GENERAL INFORMATION

4.1 STUDENT RESPONSIBILITIES

Students are expected to fully comply with the Code of Academic Integrity as detailed by the University of Arizona Dean of Students: https://deanofstudents.arizona.edu/policies-and-codes/code-academic-integrity#student_responsibility

Students engaging in academic dishonesty diminish their education and bring discredit to the academic community. Students shall not violate the Code of Academic Integrity and shall avoid situations likely to compromise academic integrity. Students shall observe the generally applicable provisions of this Code whether or not faculty members establish special rules of academic integrity for particular classes. Students are not excused from complying with this Code because of faculty members’ failure to prevent cheating.

The Graduate Program Track in Drug Discovery and Development stresses to the student the following issues of the utmost importance. First, any student who is found to be using drugs for non-experimental purposes will be expelled from the Program. Second, students are to conduct their experiments in an ethical manner; scientific fraud related to the creation of false data or the theft of others’ work will not be tolerated by this Program. Students should keep their data in a format acceptable to the research advisor and be prepared to turn over their records to the Drug Discovery and Development Track Director at any time. Third, the student is expected to complete the required and elective coursework in a timely manner under the ethical constraints of the College in which the course is being offered.

Students are expected to provide departmental service as proctors facilitating execution of exams within the College of Pharmacy graduate and PharmD courses.

Students must also be aware of Graduate College requirements and general University policies and deadlines.

4.2 ORIENTATION

All entering students are required to attend the Program’s Orientation held prior to the first day of classes.

4.3 INDIVIDUAL HEALTH INSURANCE THROUGH CAMPUS HEALTH SERVICES

Students who are hired as a Graduate Assistant/Associate (GA) are eligible to receive individual health insurance through Campus Health Services. Even though the charges for health insurance show up on your student account, the university will off-set the charge.

Health insurance coverage for the fall semester begins the Monday prior to the beginning of classes, and continues until the beginning of the spring semester. Coverage for the spring semester starts at the beginning of the spring semester and continues through the summer. New students must register for health insurance when registering for courses on-line through the UA Student Link system. Continuing students who were enrolled in student health insurance in the previous semester will be automatically re-enrolled. Once you have enrolled in the plan, your coverage cannot be canceled, even if you resign or are terminated as a GA. If you resign or are terminated from your GA during the period of coverage, you will be personally responsible for the payment of the remaining coverage.

4.4 CREATING A UA NETID AND UA EMAIL ACCOUNT, AND COLLEGE OF PHARMACY EMAIL/COMPUTER ACCOUNT

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All UA students are required to set up a UA email account (free to UA students), but first a UA Net ID must be established. The instructions on the UITS website (https://netid.arizona.edu/) will walk you through establishing your UA NetID, and then your email account. Students in the College of Pharmacy will also have a College of Pharmacy computer and email account created for them. The College of Pharmacy email will be the primary email account. Students should forward their UA email to their College of Pharmacy account so they only have to check one email account and not both.

After the UA student has created a UA Net ID, the student may access the University of Arizona UAccess Student Center System, also known as GradPath. Deadlines for the submission of paperwork pertaining to doctoral programs, as well as all forms, are available online through GradPath and can be accessed from: https://uaccess.arizona.edu/

4.5 FINANCIAL SUPPORT

Financial assistance in the form of teaching/research assistantships or traineeships is available to all first-year Ph.D. students admitted into the Program through ABBS. Later support will include either traineeships or research assistantships. Students are also encouraged to apply for individual predoctoral fellowships from sources outside the University. Appointments as teaching or research assistants provide a waiver of tuition, health insurance and a partial remission of in-state registration fees.

4.6 GRADUATE ASSISTANT/ASSOCIATE STIPEND LEVELS AND BENEFITS

<table>
<thead>
<tr>
<th>FISCAL</th>
<th>50% FY</th>
<th>TUITION WAIVER FALL/SPRING</th>
<th>100% FALL/SPRING REGISTRATION REMISSION</th>
<th>STUDENT INSURANCE FULL YEAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Graduate Assistant I (All 1st-Year Students) Late start in August</td>
<td>Refer to ABBS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Graduate Assistant II And beyond</td>
<td>$27,000</td>
<td>$20,349</td>
<td>$11,716</td>
<td>$2,088</td>
</tr>
</tbody>
</table>

4.7 GRADUATE ASSISTANTSHIPS/ASSOCIATESHIPS

Please refer to the Graduate College GA Hiring Manual for complete details regarding your GA. https://grad.arizona.edu/funding/ga

4.8 TAX INFORMATION

Students should be aware of current tax laws, which impact salaries or stipends from graduate teaching/research assistantships, fellowships, and stipends. Contact the IRS at (800) 829-1040 and ask for the scholarship/fellowship publication or visit the IRS forms/publications website at http://www.irs.gov

Graduate students, who have Graduate Assistant/Associate appointments, must be enrolled 13 units each semester to comply with the College of Pharmacy enrollment requirements.
5.0 GRADUATE STATUS AND ADMISSION

5.1 REGULAR GRADUATE STATUS

Students who meet all admission requirements may be admitted to Regular Graduate Status to undertake work leading to an advanced degree.

5.2 GRADUATE NON-DEGREE STATUS

Individuals holding a bachelor’s degree, or its equivalent, from a college or university which grants degrees recognized by The University of Arizona, may attend graduate-level courses without being admitted to a graduate degree program. Such students may enroll in graduate level coursework as their qualifications and performance permit. It is advisable to contact the department(s) offering courses of interests, to insure that the courses are available to non-degree students. Up to twelve (12) units of graduate credit, earned in non-degree status and/or transferred from other institutions, may be petitioned for application toward an advanced degree once the student obtains regular admission to a degree program. International applicants requiring a student visa are not eligible for graduate non-degree admission.

5.3 CONDITIONAL ADMISSION

Although The College of Pharmacy does not generally admit students conditionally, the program’s admissions faculty may recommend conditional admission case-by-case based only on English proficiency. Prospective students applying for conditional admission must meet all Graduate College requirements including those referring to language skills as specified at the following link:
https://grad.arizona.edu/admissions/requirements/international-applicants#english-proficiency

Conditional Admission requires that the student apply to and enroll at the UA Center for English as a Second Language (CESL) at their own expense (or their sponsor’s) with the expectation of achieving TOEFL-equivalent English proficiency within one year. The initial 1-20 will be generated by CESL to allow the student to attend CESL classes. Once CESL certifies that the student has achieved English proficiency at the TOEFL minimum, he or she will be admitted as a regular standing student.
6.0 PH.D. PROGRAM IN DRUG DISCOVERY AND DEVELOPMENT

6.1 ADMINISTRATION

The Drug Discovery and Development Track Director helps the first-year student plan his/her program with an emphasis on the first year’s courses. In succeeding years, the student’s Major Research Advisor and Dissertation Committee tailor the coursework to fit specific needs and objectives. The faculty encourages the student to take advanced courses in organic and analytical chemistry and pharmacology and to diversify his/her program with courses in pharmacology and toxicology, pharmaceutics, cancer biology, molecular and cellular biology, biochemistry, and related areas.

The Major Research Advisor and Dissertation Committee will help the student plan an educational program in which coursework is completed as quickly as possible. Because of individual interests or conflicts in scheduling, some formal coursework may extend into the third year of graduate study.

6.2 RESEARCH ADVISOR AND DISSERTATION COMMITTEE

Prior to the selection of a Major Research Advisor, the student must become familiar with the research interests of the faculty. Students should meet individually with the faculty whose research is of particular interest or potential interest. Additional familiarity is gained through the laboratory rotations.

After these preliminary interviews and research laboratory experiences, the student decides with whom he/she would like to do his/her dissertation research. After consultation with, and agreement of the faculty member, the student must communicate this decision to the Chairperson of the Program before the end of the Spring Semester. No firm commitments between students and faculty should be made until this date. The Major Research Advisor must be a tenure track full faculty member in the Program. In the event that the research project is carried out in the laboratory of an individual who is not a member of the Program faculty, a co-director from the Program Faculty must be appointed.

At the time of Major Research Advisor selection, or shortly thereafter, a Dissertation Committee is formed. The Dissertation Committee consists of three members from the Program faculty and one or two from the minor field and is chaired by the Major Research Advisor. The Major Research Advisor discusses membership of the Dissertation Committee with the student and recommends the composition of the Dissertation Committee to the Drug Discovery and Development Track Director, who may modify Committee membership. Faculty members of the Dissertation Committee are selected on the basis of their ability to provide useful advice about the research problem, to assist in selection of appropriate coursework, and to help guide the student to successful completion of degree requirements.

The first research committee meeting should take place prior to the student taking the written portion of the comprehensive examination. After this first meeting, the student will meet with their dissertation committee at least once a calendar year (June 1 - May 31) to review progress in coursework and research. It is recommended that the student have brief notes from the meeting recorded on the dissertation committee meeting form.

The student will be responsible for giving a private dissertation proposal, which will consist of a private seminar to the Dissertation Committee, which will outline the background, preliminary data, and goals of the proposed dissertation topic. The Advisory Committee will be helpful in focusing the objectives of the proposed dissertation as well as limiting the scope. It is strongly recommended that the student meet with the advisory committee shortly before scheduling the final defense. You must indicate in your Annual Report the date of your annual committee meeting.
6.3 COURSES FOR DRUG DISCOVERY AND DEVELOPMENT MAJOR

A minimum of 36 units of course work in the area of the major subject including 8 seminar credits, 6 laboratory rotation units, and a minimum of 8 research conference credits must be completed. In addition, 9 units of course work in the minor subject, and 18 units of dissertation must be completed. Courses in the Drug Discovery and Development program are listed under two different prefixes to the course numbers: PHSC and PCOL. All research and dissertation units are registered under PHSC.

REQUIRED CORE COURSES:

Year 1:
PHSC 530: Introduction to Molecular Therapeutics and Drug Discovery (3 units, fall)
CHEM 550: Synthetic & Mechanistic Organic Chem (3 units, fall)
BIOC 565: Proteins and Enzymes (3 units, fall year 1; or optionally year 2)
PHSC 670: Principles in Drug Discovery, Design, and Development (4 units, spring)
MCB (PHSC) 795a: ABBS Laboratory rotations (2 units per rotation; fall & spring: 6 units total)
BCP Laboratory rotations with ABBS participating faculty (together with BCP Journal Club)
PHSC 596a: Seminar (1 unit per semester fall & spring semester: attendance required when enrolled; 8 units total)
PHCL 595b: Science Writing, Presentation & Bioethics (spring 2 units)

Year 2:
PCOL 695a: Research Conference (1 unit; fall & spring; second year and beyond: 8 units total)
PHSC 596a: Seminar (1 unit per semester fall & spring semester: attendance required when enrolled; 8 units total)

Electives are optional:
There are many elective possibilities from a variety of related graduate programs from within the College of Pharmacy (Pharmacology and Toxicology, Pharmaceutics) and outside (Chemistry/Biochemistry, and Cancer Biology).

Fall Electives:
PCOL 601a: Epigenetics in Development and Disease (2 units)
PCOL 630B: Cell communication & Signaling (3 units)
PHSC 603: Topics in Pharmaceutics (2 units)
CBIO 597a: Experimental Design (1 unit)
CBIO 552: Cancer Biology (4 units)
CHEM 584: Nuclear Magnetic Resonance Spectroscopy (3 units)
CHEM 543: Structural Organic Chemistry (3 units)

Spring Electives:
PCOL 550: Drug Metabolism and Disposition (2 units)
PHSC 610: Topics in Pharmaceutical Solids, Nanotechnology and Solid-State Particle Engineering Design in Drug Delivery (3 units)
BIOC 585: Biological Structure I (4 units)
BIOC 568: Nucleic Acids (4 units)
CBIO 553: Advanced Topics in Cancer Biology (4 units)
CBIO 597a: Grant Writing for Graduate Student (1 unit)
PCOL 630A: Cell communication & Signaling (3 units)
CHEM 541: Mechanisms of Organic Reactions (3 units)
CHEM 548 Advanced Synthetic Chemistry (3 units)
CHEM 587: Intro to Molecular Spectroscopy (3 units)
CHEM 534A/B: Practical NMR Spectroscopy (3 units)

6.4 SEMINAR PHSC 596A, 1 CREDIT HOUR (TUESDAYS, 4:00–4:50 pm)

Students are required to attend a weekly seminar, consisting primarily of scientists from other institutions, on various subjects related to Drug Discovery and Development. The students are also encouraged to invite one speaker each semester. First and second year students do not present at the DDD seminar, so their grade will be determined by attendance only (refer to specific syllabus for grading scale). Students in year three are
expected to present their graduate research project at the DDD seminar. Students in year four are expected to
give a presentation in the DDD seminar series covering a contemporary research topic in scholarly depth
(inspired by recent peer-reviewed literature). Students who have chosen to participate in the BCP program are
also required to attend a weekly journal club/research-in-progress seminar, in which they will present their
work at least once each year.

6.5 **LABORATORY ROTATIONS**

ABBS graduate program members: follow guidelines and procedures as applicable.
Each first-year student must participate research laboratory rotations (MCB (PHSC) 795a, The objective of the
required laboratory research rotations is the introduction of the graduate student to research and familiarization
with the scope and nature of the faculty’s research endeavors. The research laboratory rotation constitutes a
major part of the first-year graduate curriculum, and performance in the rotation will bear heavily upon overall
evaluation of the student. Performance criteria to be used by the laboratory director will include assessment of
the student’s initial familiarity with the research, the development of library and literature skills, ability to
apply the scientific method and use pharmacological and toxicological principles, development of laboratory
skills, attitude toward the research project, and a final written report prepared by the student

Please refer to the schedule as specified by ABBS in your respective first year of graduate study.

6.6 **MINOR REQUIREMENTS**

One minor is required. Students may choose from among the following approved minor list. Other options will
be considered but must be approved individually by the Executive Committee and Track Director of the
Program (minimum of 9 units).

6.7 **SUGGESTED MINORS FOR DRUG DISCOVERY & DEVELOPMENT MAJORS**

1. Multidisciplinary
2. Chemistry/Biochemistry (BCP)
3. Molecular and Cellular Biology
4. Pharmacology & Toxicology
5. Microbiology and Immunology
6. Cancer Biology
7. Neuroscience
8. Medical Pharmacology
9. Physiology

For a multidisciplinary minor, the DDD graduate student selects graduate level courses from various programs,
and the selection is to be approved by the student’s PhD Advisor. For all other minors, the DDD graduate
student selects graduate level courses from the respective graduate programs; this selection is to be approved
by the minor advisor (to be appointed as a member of the student’s graduate committee).

6.8 **MINOR IN DRUG DISCOVERY & DEVELOPMENT FOR STUDENTS IN OTHER PROGRAMS**

The faculty welcomes graduate students in other departments and programs of the University in minor in Drug
Discovery and Development. Students are required to contact the Program Office and the Graduate Track
Director before proceeding with a minor. A student may minor in Drug Discovery and Development by
completing nine units of coursework listed below:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHSC 670</td>
<td>Principles in Drug Discovery, Design, and Development</td>
<td>4</td>
</tr>
<tr>
<td>PHSC 530</td>
<td>Introduction to Molecular Therapeutics and Drug Discovery</td>
<td>3</td>
</tr>
<tr>
<td>BIOC 565:</td>
<td>Proteins and Enzymes</td>
<td>3</td>
</tr>
</tbody>
</table>
No more than one of the following courses:

PCOL 601a: Epigenetics in Development and Disease 2 unit
PCOL550 Drug Metabolism and Disposition 2 units

6.9 CREDIT REQUIREMENTS AND TRANSFER CREDIT

A minimum of 36 units of course work in the area of the major subject, 9 units in the minor subject, and 18 units of dissertation must be completed. Graduate credit earned at other approved institutions, if accepted by the major department and the Graduate College and grade was A or B, may be counted toward the requirements of this degree, but will not be calculated in The University of Arizona G.P.A. All required units of credit must be at the 500-level or above at The University of Arizona (or, in the case of transfer units, their equivalent at other institutions). At least one half the units used on the Doctoral Plan of Study must be in courses in which regular grades (A, B, C) have been earned. A minimum of 12 units of regular grades taken at The University of Arizona are required to establish a University of Arizona G.P.A. Credit for correspondence courses or extension work obtained at other institutions will not be accepted for graduate credit.

Students who wish to use transfer credit must first submit a request form in GradPath before the end of their first year of study. This allows the Graduate College to evaluate the transfer credit while the transcripts are still in the Graduate College, and ensures that students will know early in their studies whether or not the credits are acceptable. The Graduate College evaluation simply determines whether or not the courses are eligible for transfer; the Drug Discovery and Development Executive Committee will still decide which courses should be part of the Program of Study.

6.10 REGISTRATION

Registration is accomplished through the University of Arizona UAccess Student Center System. UAccess Student Center can be accessed from: https://uaccess.arizona.edu/ Contact the Program office for registration of courses that are not open to web registration.

6.11 GRADUATE APPOINTMENTS MINIMUM REGISTRATION

All graduate students in the College of Pharmacy who are supported by or through the University are considered to be full-time students. All full-time students are expected to enroll for some combination of coursework, research, or independent study that results in a minimum of twelve (12) units of credit for the academic semester. Students completing their degree in an academic semester may register for less than (12) units as determined by the Major Advisor and Program Office.

6.12 MINIMUM REGISTRATION REQUIREMENTS FOR STUDENTS NOT RECEIVING FUNDING

Each student who is associated with the University in any capacity that utilizes University facilities or faculty time during any academic semester must be registered for at least three (3) units of graduate credit. Each student completing requirements for an advanced degree must be registered during the semester term during which requirements are completed, or the previous semester or term if requirements are completed during an intercession. This includes any semester during which a preliminary or final examination is scheduled.

Ph.D. students who have completed all the degree course requirements but have not completed the comprehensive examination should enroll for Research (PHSC 900). After completion of the comprehensive examination Ph.D. students should enroll for dissertation (PHSC 920).
**Full-time Graduate Student Status:** A student who has completed all course work, the thesis/dissertation unit requirements, has advanced to candidacy, is working on the thesis/dissertation, and is not employed as a Graduate Assistant/Associate may apply for advanced status at: https://arizona.app.box.com/v/grad-gsas-advancedstatus which allows 1 unit of 900-level credit for full-time status. In all other cases, full-time status consists of a minimum enrollment in 9 units of graduate credit.

### 6.13 Grades in Core Courses

Students must receive a grade of B or better in all core courses. A student who receives a grade of C or less in a core course must repeat that course. A student may petition to have this repeat requirement waived; a waiver can be granted only with the written approval of the course instructor and the Drug Discovery and Development Graduate Executive Committee. A grade of C or less in a core course constitutes grounds for dismissal from the Graduate Program.

### 6.14 Minimum Academic Requirements

A student cannot receive a graduate degree unless he or she has achieved a grade-point average of 3.00 or higher on all course work taken for graduate credit, whether or not the courses are offered in satisfaction of the specific requirements for a specific graduate degree. A student whose cumulative GPA is below 3.0 for two consecutive semesters will be dismissed and may then reapply for non-degree status. Programs may allow students to take additional course work while in non-degree status. In order to graduate, the student may apply for readmission to the Graduate College through their graduate department. Readmission is not guaranteed.

### 6.15 Satisfactory Academic Progress

In addition to maintaining a minimum 3.0 grade-point average, students are required to demonstrate satisfactory academic progress toward degree completion. The Program’s policies on what constitutes satisfactory academic progress are listed below.

- **Minimum Grades in a Required Course** - Students must receive a grade of "B" or better in all core courses. A student who receives a grade of "C" or less in a required course must repeat that course. Students failing to obtain a “B” or higher in a required course that is repeated must petition the graduate program faculty to remain in the program. The decision to allow the student to continue in the program requires a majority approval of the program faculty, with two negative votes sufficient for termination.

- **Student Evaluation** – The Program Executive Committee evaluates each student on the basis of accomplishments in formal courses and performance in other areas of the Program including attendance and participation in seminars as well as performance in laboratory rotations. Satisfactory performance in courses and research are also required. Failure to meet performance criteria in any of these areas is grounds for recommendation of dismissal from the Program.

- **Annual Reports** - All students will submit an annual report to the Graduate Program Coordinator, on or before June 1. The Annual Report must be approved and signed by the graduate track director (first year students) or the Major Research Advisor (all other students) for submission to:
  [http://gradstudent.pharmacy.arizona.edu/](http://gradstudent.pharmacy.arizona.edu/)

- **Sponsorship** - By June 15 the Executive Committee makes a determination if each first year student should be sponsored for the following year. This determination will be assessed yearly thereafter. Poor performance in assigned duties may result in the loss of sponsorship. Sponsorship decisions after the first year are made by the student’s major advisor.

- **Advancement to Candidacy** – Advancement to Candidacy requires successful comprehensive examination. If performance is substandard in any portion of the examination, the Dissertation Committee may recommend 1) may recommend exam re-take within 60 days of the original exam, 2)
withdrawal from program sponsorship, 3) dismissal, 4) or may recommend that the student opts to leave the DDD program with a Master's degree. If performance during comprehensive examination has been satisfactory, the student advances to candidacy.

- **Dissertation/Thesis Committee Meetings** - All students are required, after the formation of a dissertation/thesis committee, to have at least one committee meeting per year while in the Program (refer to committee meeting guidelines under section 6.2 Research Advisor and Dissertation Committee.  
- **Completion Guidelines** – Students will complete the following according to the time-frame listed below.
<table>
<thead>
<tr>
<th>YEAR</th>
<th>TIME-FRAME GUIDELINES</th>
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</table>
| YEAR 1 (fall/spring/summer) | Complete 3 (ABBS) Laboratory Rotations  
|                       | Complete Deficiency Coursework (if applicable)  
|                       | Begin Core Coursework  
|                       | End of spring semester — Selection of Mentor/Research Advisor and begin Doctoral Research                                                                                                                               |
| YEAR 2 (fall/spring/summer) | Continue Doctoral Research  
|                       | Complete Core Coursework  
|                       | **By end of Fall semester:**  
|                       | Submit Doctoral Plan of Study to Program Office  
|                       | Select Oral Comp Committee and arrange 1st Annual Committee Meeting  
|                       | *(presenting Thesis & coursework overview research Topic and Experimental Plan)*  
|                       | **By end of Spring semester / Beginning of Summer:**  
|                       | **Pass Written Comprehensive Examination:** *(Portion A: Take home exam)*                                                                                                                                            |
| YEAR 3 (fall/spring/summer) | Continue Doctoral Research  
|                       | **Pass Written Comprehensive Examination:** *(Portion B: Research Proposal)*  
|                       | **Portion B1:** Assemble Research Proposal (Specific Aims Page ONLY)  
|                       | **Arrange 2nd Annual Committee Meeting:**  
|                       | *(discuss General Progress on Thesis research and obtain committee approval of Intended Research Proposal - Topic and Specific Aims Page only)*  
|                       | **Portion B2:** Compose Full Research Proposal and Receive Committee feedback & approval to Defend (via email): Upon approval, submit signed Written Exam Form  
|                       | **Pass Oral Comprehensive Exam:** *(Administered by Dissertation Committee)*  
|                       | **Portion A:** Orally Defend Research Proposal (from Portion B2)  
|                       | **Portion B:** Oral Exam General Knowledge (based on Graduate Coursework)  
|                       | Submit Dissertation Committee Appointment Form (via GradPath)                                                                                                                                                    |
| YEARS 4 and 5 (fall/spring/summer) | Continue Doctoral Research  
|                       | 3rd and 4th Annual Committee Meeting – Discuss General Progress and Plans / Timeline Toward Dissertation Finalization  
|                       | Pass Final Examination (Dissertation Defense)  
|                       | Identify Employment Opportunities                                                                                                                                                                                   |
| YEARLY | Students must receive at least a B grade in all core courses  
| | Attend weekly seminar program  
| | Complete annual report (on or before June 1)  
| | Students supported by or through the University are expected to enroll for 13 units of credit each academic semester  

6.16  **Appeals Process**

If a student wishes to appeal any of the aforementioned requirements the appeal should be made in writing to the Director of the Program Track (Drug Discovery & Development). The appeal will be reviewed by the program faculty and may include a collective meeting with the student. A decision to accept the appeal of the program faculty will be based on a majority vote. The program faculty may place additional requirements/deadlines on the student as a prerequisite for continuing in the program.

Students may also appeal any departmental decision. Students who wish to appeal the decision of the program faculty must submit an appeal in writing to the Director of Graduate Studies in the College of Pharmacy. For additional information regarding appeals and complaints, please refer to the Graduate College webpage here: https://grad.arizona.edu/policies/academic-policies/summary-grievance-types-and-responsible-parties

6.17  **Student Evaluation**

On behalf of the Program Faculty, the dissertation committee annually evaluates each student on the basis of accomplishments in formal courses and performance in other areas of the Program including lab research as well as attendance and participation in seminars. Satisfactory performance in courses and research are required. Failure to meet performance criteria in any of these areas will result in a written warning with an opportunity to remediate. Continued failure to meet performance criteria is grounds for recommendation to the Graduate College that the student be dismissed from the Program.

6.18  **Annual Reports**

All students are required to submit an Annual Report, annually, on or before June 1. An email notice will be sent out from the Program Office containing specific instruction for submission, using the online link at: http://gradstudent.pharmacy.arizona.edu/

The Annual Report must be approved electronically by the DDD Graduate Program Track Director (first year students and all others) and the Major Research Advisor (2nd year students and beyond). Annual Reports documenting progress are mandatory for every year matriculating in the program.

For each first year student having completed the first year, the DDD Track faculty will make a specific recommendation regarding continuous sponsorship for the following year by June 15. For second year students, Advancement to Candidacy will be recommended at the time of successful completion of the comprehensive examination. If performance is substandard, the DDD Track faculty may recommend a probationary period, withdraw program sponsorship, seek dismissal, or may request the student to fulfill the requirements for a Master's degree.

The Annual Report will list courses taken and grades received, committee meeting(s) held, abstracts and papers published, seminars and report presentations, honors, outside funding, and a succinct and lucid summary of research progress.

Graduate students are also required to prepare and submit a written Individual Development Plan (IDP) as part of their Annual Report. The IDP allows the graduate student to determine training goals, needs for professional development, and career objectives to be presented and discussed at the Annual Committee Meeting. The IDP is to be prepared according to AAAS guidelines and submitted online at: http://myidp.sciencecareers.org/
The Annual Report must be approved by the Drug Discovery and Development Track Director and signed by the Drug Discovery and Development Track Director before the year’s work is considered complete. Students who do not meet this deadline will receive a one-time letter requesting the information be provided immediately or the student will be dropped from the Program for failure to meet Program degree requirements. After progression to candidacy, overall academic performance and research progress will be assessed during the Annual Dissertation Committee Meeting. Failure to meet performance criteria in any of these areas is grounds for recommendation of dismissal from the Program.

6.19 QUALIFYING EXAMINATION

Satisfactory completion of the first two year’s work constitutes passing of the Qualifying Examination. This entails that the student attain grades of no less than B in core courses and maintain a GPA of at least 3.0. Part of the evaluation includes the submission and approval of an Annual Report outlining his/her activities during that year.

6.20 PLAN OF STUDY

In conjunction with his/her major professor or advisor, each student is responsible for developing a Plan of Study during their first year in residence, to be filed online in GradPath no later than the student's third semester in residence. The Plan of Study identifies (1) courses the student intends to transfer from other institutions; (2) courses already completed at The University of Arizona which the student intends to apply toward the graduate degree; and (3) additional course work to be completed in order to fulfill degree requirements. The Plan of Study must have the approval of the student's major professor and department head (or Director of Graduate Studies) before it is submitted to the Graduate College.

6.21 COMPREHENSIVE EXAMINATION

Before advancing to formal candidacy for the Ph.D. degree, all Drug Discovery and Development graduate students must pass a comprehensive examination. General information about the comprehensive examination is provided by the Graduate College here: [https://grad.arizona.edu/gsas/degree-requirements/doctor-philosophy#comprehensive-exam](https://grad.arizona.edu/gsas/degree-requirements/doctor-philosophy#comprehensive-exam).

In order to enter comprehensive examination, the Pharmaceutical Sciences Graduate Program stipulates that the student must have passed the required core courses in the program with a grade of B (3.0) or better in each course. The comprehensive examination consists of: (1) a Written portion (part A: Take-home exam; and part B: research proposal) and (2) an Oral Comprehensive portion (part A: defense of the research proposal; and part B: examination on subjects of general coursework). Each student’s dissertation committee serves as the comprehensive examination committee. Regular committee meetings are chaired by the dissertation advisor; however, a DDD faculty presides the comprehensive exam related committee meetings.

**Timeline:**
The written portion part A (Take-home exam) should be taken immediately after the completion of the second year (end of spring semester early summer). After passing the written portion part A, the candidate will prepare the written portion part B (research proposal) that must be approved by all committee members. After passing the written portion of the comprehensive exam (portions A and B), a day for the oral comprehensive examination can be scheduled. On the day of the oral comprehensive examination, the student will be examined in two areas: part A (defense of research proposal) and part B (examination on subjects of general coursework). The oral comprehensive must be completed by the end of year three. This timeline can be extended ONLY under special circumstances, and an extension requires the approval of the Drug Discovery and Development Executive Committee.
1. **Written Examination (part A and B)**

The written comprehensive examination is comprised of two parts:

**Part A: Take-home exam:** The first part of the written examination consists of a take-home exam with questions prepared by members of the DDD faculty who serve as an exam committee. This group will generate a series of five questions. All DDD students eligible for comprehensive examinations will then select three of the five questions to answer. After receiving the complete list of questions from the DDD Track Director, the student has five days to select the questions to be answered. During these five days, the student may discuss with each primary faculty authoring a specific question what is expected in terms of answering the question and any portions of the question that may not be clear to the student. By the end of these five days the student must make the selection of questions to be answered and inform the Track Director.

The goal of this part of the written exam is to teach the student (1) to rapidly assimilate a body of information from the primary literature, (2) to critically evaluate the data within the body of information, summarize the key concepts, and define unsolved problems, (3) to formulate models or hypotheses, (4) to devise experimental approaches to test the predictions of the models or hypotheses, and (5) to communicate the approaches and results in a concise and informative manner. Thus, the format of each question should require the student to learn a concept or principle from a field within the primary literature and then to use the concept or principle to solve a problem or test a hypothesis. The scope of each question should be limited so that it can be concisely answered within no more than ten double-spaced typed pages. The student is allowed three weeks to answer the chosen questions. At the end of the three-week period, the written answers to the three questions are submitted electronically to the Drug Discovery and Development Graduate Program Track Director. Students may use library resources, but each student taking the exam must work completely independently of other students taking the exam and in compliance with the University of Arizona’s academic code of conduct (https://deanofstudents.arizona.edu/policies-and-codes/code-academic-integrity).

The faculty members who wrote the questions that the student chooses to answer will serve as the primary reviewers of the questions. The other members of the exam committee will serve as secondary reviewers. After submission of the completed written take-home exam to the Track Director, each question will be graded as a pass or fail within ten days of receiving the student’s written answers.

**Outcomes Part A:** Each of the three questions will be graded as a ‘pass’ or ‘fail’ and the faculty responsible for grading the specific question has to communicate the result to the track director. All three questions must be answered satisfactorily in order to pass this portion of the written exam. If one or more of the questions are graded as fail, the candidate will be asked to answer one or more of the remaining questions. If the candidate does not satisfactorily complete three of the five questions, the student’s continued participation in the program must be discussed with the student’s complete Dissertation Committee including the DDD Track Director.

**Part B: Research Proposal:** After successful completion of part A, the candidate prepares a NIH R01 style research proposal. First, a specific aims page summarizing the key aspects of the proposed research has to be prepared and discussed during the meeting of the advisory committee. The candidate prepares a revised version of the specific aims page taking into consideration the feedback of the advisory committee (beginning of year three, fall semester). After this revised version of the specific Aims page has been approved by all members of the committee (via email consent), the candidate now assembles a full NIH-style grant proposal.

**Research Proposal Preparation Specifics:** The topic of the research proposal must be **sufficiently different** from the student’s dissertation research. The proposal must represent an original research project that does not originate from the student’s dissertation topic and should be an independent synthesis of ideas and experimental design from within the student’s field of interest. It is the student’s Graduate Committee members that determine the appropriateness and originality of the chosen topic.
Portion B1: First, the topic of the research proposal is prepared by the student as a Specific Aims Page ONLY. Information on general format and content (template) of a full NIH R01 style research proposal must be provided by the research advisor. During the 2nd Annual Committee Meeting, the topic and content of the specific Aims are discussed and approved by the dissertation committee.

Portion B2: Based on the feedback received by the committee a full Research Proposal is composed and submitted to every committee member for electronic feedback. Information on general format and content (template) of a full NIH R01 style research proposal must be provided by the research advisor. After receiving feedback, the student revises the proposal accordingly and submits electronic version of the final write-up for approval by every single committee member. (Every member of the committee signs the ‘COP Comprehensive Written Examination Results Form’: see above).

The responsibility for the quality of the proposal, which includes originality, practicality, significance, and methodology, rests entirely with the student. The student may seek general advice from members of the dissertation committee including the Dissertation Director, but should not expect them to be active participants in the generation and completion of the proposal.

Typical preparation time towards a complete proposal is between 2 to 6 weeks writing this draft. Like any other good grant proposal, quality will come from spending a lot of time thinking about the potential flaws in the proposal and then finding solutions. It is advisable to ask fellow students and colleagues to critique the document before it is distributed to the dissertation committee. The proposal should have a Title that accurately describes the major hypothesis. This should be followed by an abstract (<200 words) that concisely summarizes the problem being addressed and the proposed experimental approaches (specific aims). The body of the proposal should include background information, enumerated specific aims, methods of approach, and an appraisal of the significance of the proposition. An excessive bibliography should be avoided; however, it needs to include all pertinent references in which the methods are described and any relevant papers that support the goals of the proposal. Use primary references where possible, avoiding excessive reliance on reviews. The total written proposal, including figures and tables, but excluding references, should be limited to 20 double-spaced typewritten pages. Detailed descriptions of established methods can be left to the oral defense. The submitted document should be proofed carefully for grammar and spelling. As specified above, the dissertation advisor will provide a valid template for the composition of an R01 style proposal. The format below should be taken as a suggestion with the exception of the total length of the text:

I. Title Page
II. Abstract
III. Specific Aims (1 page only)
IV. Research Plan (12 page R01)
   A. Hypothesis/Specific Aims
   B. Background and Significance
   C. Experimental Design
V. References (include full article titles)
VI. Appendix (Optional)

When the proposal has been written as well as possible, an electronic copy should then be submitted to each member of the committee. The committee will need two weeks to critique the proposal and to give electronic feedback. The dissertation committee has the option of requesting revision of the proposal. The dissertation committee will not sign off on this part of the preliminary exam until the document is acceptable.

**Outcomes Part B:** After completing the written research proposal and obtaining a ‘pass’ by every committee member (by signing the COP Comprehensive Written Examination Results Form), the candidate has fulfilled
the requirements for the Written Comprehensive Examination. The candidate now proceeds towards the Oral Comprehensive Examination which has to be passed by the end of year three.

2. ORAL EXAMINATION

The student’s Dissertation Committee is responsible for administering the oral examination. Policies and Procedures for Oral Comprehensive Examination for Doctoral Candidacy at: [https://arizona.app.box.com/grad-gsas-comporalexam](https://arizona.app.box.com/grad-gsas-comporalexam) The student is responsible for scheduling the Oral examination through GradPath. No student will be allowed to officially schedule the oral exam unless the written exam has been passed, although a tentative date can be arranged at any time with the Dissertation Committee. The student is responsible for scheduling the room for the oral exam. At the beginning of the Oral Comprehensive Exam, the student is expected to provide a brief summary of graduate coursework completed and respective grades obtained. They should also bring the Outcomes Assessment Form (Appendix I) and the Prospectus Proposal Confirmation (Appendix II, g). It is the committee chair’s duty to report the exam results through GradPath link online.

The oral portion of the comprehensive exam generally will consist of two components: (1) a defense of an original research proposal and (2) questions concerning general knowledge within the field of Drug Discovery & Development. The defense of the research proposition will test the student’s ability to generate original ideas and to defend the adequacy of the proposal for solving the problems addressed. It is expected that the student will demonstrate a reasonable knowledge of the literature and special techniques of the field. The general questioning portion may account for up to 50% of the oral examination. The general questions will primarily be derived from both the core and elective courses that the student has taken. Additional questions pertaining to the questions from the written portion of the exam may also be asked. The oral exam must last a minimum of 2 hours, but cannot exceed 3 hours. It is common for the student to give a 5- to 10-minute overview of the research proposal followed by questions from the committee centered about a defense of the research proposal (1 to 1.5 hours). The best way to study for the exam is (1) to know the proposal thoroughly, including all related topics, (2) to review all class notes and lecture material from all classes taken as a graduate student up to that point, especially the core course material, and (3) to be familiar with the recent literature (particularly in the fields represented by the committee members). It is important to plan your studying so that you do not get “burned out” before the exam. Know what material you want to cover and then systematically go through it. It is an excellent idea to have at least one “practice oral exam” with other graduate students and postdoctoral associates about two weeks before the scheduled exam. This can be very helpful in identifying weaknesses and will give students practice thinking on their feet.

6.22 FAILURE OF THE SECOND ATTEMPT OF THE ORAL COMPREHENSIVE EXAMINATION

Students who fail a second attempt of the oral comprehensive examination are automatically dismissed from the Ph.D. Program. It is possible, with a recommendation from the comprehensive examination committee, to convert the student to the M.S. Program.

6.23 ADVANCEMENT TO CANDIDACY

When a student has passed the oral comprehensive examination and all coursework on the Plan of Study is complete, the student will advance to doctoral candidacy. At that time, the bursar account will be billed the candidacy fees of $15. These are one-time fees and the student will not be billed again if they change their anticipated graduation date.

After passing the Oral Comprehensive Exam, the student is required to submit the Committee Appointment Form to the Graduate Degree Certification Office. The Final Oral Defense Examination cannot be scheduled until at least six months after the form is received. Deadlines for the submission of paperwork pertaining to doctoral programs, as well as all forms, are available via GradPath at the Graduate College Website: [http://grad.arizona.edu/](http://grad.arizona.edu/)
6.24 FINAL EXAMINATION

Upon the completion of the dissertation, the candidate is to submit to a Final Oral Defense Examination. A student must be in good academic standing to schedule the defense. The examination focuses on the dissertation itself but can include general questioning related to the field(s) of study within the scope of the dissertation.

The exact time and place of this examination must be scheduled with the Graduate Student Academic Services (GSAS) at least 7 working days in advance. Announcement of Final Oral Examination form must be filed with GSAS. A format correct copy of the dissertation must be delivered by the candidate to each committee member at least ten (10) working days before the examination. The student should print out two (2) dissertation approval pages, and bring them to the defense. It is expedient to get all signatures at the defense.

The dissertation director presides over the examination. The examination is closed to the public, except for an initial seminar portion during which the student presents the dissertation and entertains questions. There is no minimum time limit for the Final Oral Examination, but the entire proceedings may not exceed three hours. Members of the committee must be present for the entire examination.

6.25 DISSERTATION

This begins when the student picks a laboratory and advisor. Planning the research program begins in meetings with the Major Advisor and the Dissertation Committee. The Committee reviews the goals and experimental approaches summarized by the candidate, particularly in relation to the objectives set out in the dissertation proposal, and helps formulate and approve any changes or new plans deemed appropriate. At this time it may become necessary to increase the frequency of Dissertation Committee meetings. The candidate is expected to fulfill specific goals recommended by the Committee.

Preparation of the written dissertation follows the Graduate College rules, Student's Manual for Theses and Dissertations (http://grad.arizona.edu/academics/degree-certification/diss-theses/manuals). When the dissertation is written, the candidate submits a copy to each member of his/her committee ten (10) working days prior to the final examination. The Announcement of Final Examination must be filed with the Graduate Degree Certification no later than seven (7) working days before the examination date.

6.26 LIMITATION ON TIME SPANS

The Ph.D. degree with a major in Drug Discovery and Development usually requires approximately 4.5-5 years of education beyond the baccalaureate degree. As the success of laboratory experiments or the time required for their completion cannot be predicted accurately, more time may be required for completion of degree requirements.

Note: Graduate coursework credit, to be applicable toward a degree, must have been earned not more than five (5) years prior to the completion of the requirements for the degree. This includes graduate credit earned for a master's degree, if applicable. The Graduate Council has instructed that petitions for time-limitation waivers should only be entertained under circumstances that are judged to be extraordinary and extenuating.

6.27 TIMETABLE, FORMAL DOCUMENTATION, AND DEADLINE DATES

The following forms and deadlines are required by the College of Pharmacy Graduate Programs Office and Graduate Student Academic Services. All forms can be downloaded from the Graduate College website.
(http://grad.arizona.edu/) and are submitted in GradPath through the University of Arizona UAccess Student Center System. UAccess Student Center can be accessed from: https://uaccess.arizona.edu/ 

- Responsible Conduct of Research (1st month in residence)
- Code of Academic Integrity (1st month in residence)
- Doctoral Plan of Study (3rd semester in residence)
- Oral Comprehensive Examination Committee Form (3rd semester in residence; documenting the assembly of the faculty members that will conduct the Oral Comprehensive Exam covering members from major and minor programs. The Oral Committee Chair should be a DDD faculty member). After successful completion of the Oral Comprehensive Exam, a final Dissertation Committee is assembled based on minor modifications to accommodate program membership requirements.
- Announcement of Doctoral Comprehensive Exam (submit no later than one month prior to Oral Examination)
- Doctoral Dissertation Committee Appointment (submit no later than 6 months prior to defending). The Program recommends submitting the Committee Appointment form immediately following completion of the Oral Comprehensive Examination.
- Prospectus Proposal Confirmation (print from GradPath and take form to Oral Examination)
- Announcement of Final Oral Defense (submit no later than one month prior to defense). A format correct copy of the dissertation must be given to each committee member, ten (10) working days before the examination.

6.28 SCIENTIFIC MEETINGS

As part of the educational process, students in training will be encouraged to attend national scientific meetings, as travel support permits. Priority for travel support will be given to students presenting communications at national meetings such as the American Chemical Society, American Association for Cancer Research, American Association of Pharmaceutical Scientists, Gordon and Keystone Conferences, AACR/NCI/EORTC, and related meetings. Students should discuss participation in meetings and travel support with their Research Advisors. Students may also apply for travel funds available from the Graduate Program Office. The Program Office requires a copy of any communications presented (e.g., abstracts).
APPENDIX A

It is the duty of the advisor and the student that these forms are obtained and completed by the respective
deadline. Forms can be obtained from the following link: http://gradstudent.pharmacy.arizona.edu/

I. College of Pharmacy Graduate Programs Forms

   a. Pre-doctoral Time-line of Training (In your Welcome packet)
      The Graduate Program Coordinator will meet with the graduate student to review the forms and
      required timelines of the program.

   b. Student Annual Committee Report
      For every annual committee meeting the following form needs to be completed and signed by
      every committee member. Form at: http://gradstudent.pharmacy.arizona.edu/

   c. Annual Progress Report
      For every year, an Annual Progress Report has to be completed by the student, then reviewed and
      signed by the advisor, followed by submission to the Track Director. Submission must occur by
      June 1st using the following link http://gradstudent.pharmacy.arizona.edu/

   d. Written Comprehensive Examination Results Form (Written Comprehensive Portion B2)
      A student must obtain signatures from their committee once the research proposal has been
      approved. Form at: http://gradstudent.pharmacy.arizona.edu/

   e. Student Outcomes Assessment Form
      Members of the Comprehensive Exam Committee will fill out this form after the Oral Examination,
      and use it only as a measurement for the outcomes and not for the purpose of grading the Oral
      Comp Exam. The student will take one form for each committee member to the Oral Exam
      (included in the Oral Exam Packet from the Graduate Programs Office).