PHAR 6726 PRINCIPLES OF PHARMACOLOGY

Meeting Time, Place, Credits

Credits:	2.3 credits (40 in-class/80 out of class)
Course Web Site:	**https://canvas.umn.edu/courses/102954**
Term:	Spring 2020
Course Schedule and Location:	See lecture schedule
Dates:	January 17 – May 14, 2020
Target audience:	PD1

Course Instructional Team

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Overview of the Course

COURSE CONTENT

Principles of Pharmacology is an introductory course for PD1 students that build on information provided in basic science courses offered in the PD1 fall semester. *Principles of Pharmacology* provides foundational content necessary for comprehension and application of all subsequent pharmacology sections of the curriculum as well as concurrent and subsequent basic science and pharmacotherapy modules that require application of pharmacological concepts and knowledge. The course content is aligned with concurrent content of the *Principles of Medicinal Chemistry* and *Applied Pharmaceutical Care* courses. The purpose of this course is to provide students with a solid scientific foundation that will facilitate the understanding of clinical pharmacotherapy material. The course is divided into *four main content sections*:

1) The **"principles"** section of the course provides instruction concerning receptor theory and topics critical for the comprehension and analysis of graphical and tabular depictions of drug-receptor interactions used in the literature. These topics include terminology describing ligand-receptor interactions, agonist and antagonist mechanisms of action (MOA), analysis of drug concentration-effect curves, types of receptors involved in signal transduction and signal transduction pathways as targets for drug action, functional selectivity/"biased signaling", allosteric modulation of endogenous ligand-receptor interactions, regulation of receptors (e.g., receptor desensitization, up- and down-regulation), and general mechanisms that account for the toxic effects of drugs. These topics include pharmacological concepts that constitute an essential part of the foundation for understanding and lifetime learning of current and future drugs.
2) An **"applied principles"** section addresses conditions that can affect drug action and drug response. Both desired and undesired drug actions can be modified by various conditions, e.g., genetic, food, stage of development, presence of other drugs, etc., that can alter an individual's response to a drug. This section focuses on *pharmacogenomic* and other factors, e.g., *ADME* (absorption, distribution, metabolism and excretion) and general mechanisms of *drug interactions*.
3) The **"autacoids"** section of the course concerns two endogenous signaling systems – *histaminergic* and *eicosanoids*. This section focuses on the MOA and effects of histamine and selected eicosanoids and how these agents (or synthetic ligands) or drugs that alter their impact (e.g., antagonists and synthesis inhibitors) can be employed in pharmacotherapy.
4) The "**autonomic pharmacology**" section provides instruction and practice exercises to reinforce learning concerning drug targets (receptors, enzymes and transporters) that can be exploited in therapy to increase or decrease the basic functions of cells innervated by the autonomic nervous system. The focus will be on the mechanism(s) of action of autonomic agonists and antagonists, desired and off-target effects, and how the desired effects can be exploited in the treatment of various pathologies.

COURSE FORMAT

Principles of Pharmacology will be a lecture/discussion based course. Basic science elements comprise the major portion of the course; the course topics are listed above (Course Content). In this course, students are expected to prepare in advance of each class session. It is anticipated that students will need a ***minimum of two hours study outside class for every in-class hour***. Students will be assigned reading materials ranging from textbooks to topical review articles. Individual faculty may elect to offer online problem sets or study guides, or in some cases, lectures to guide the advanced preparation. In this way, the class sessions will be able to offer more in-depth content, and there may be greater opportunity for in class discussion, turning point-enabled in-class problem solving, and team-based learning. Assessments will include quizzes, major exams and a comprehensive, cumulative final examination.

PREREQUISITES

- Drug Literature Evaluation (included in the Foundations of SAPh course [weeks 4-5] in the PD1 fall semester)
- Physics, Biochemistry, General Biology
- Cell Biology (including: introductory cell-signaling, genetics and pathophysiology of inflammation)
- General mammalian systems physiology (neuronal, endocrine, gastrointestinal, immunologic, cardiovascular, pulmonary, renal, skeletal muscle systems)
- Basics of signal transduction (Pharmacology builds upon and expands on this topic)
- Regulation and function of excitable cells (i.e., cellular processes governing function of skeletal muscle, cardiac muscle, smooth muscle, nerves, and secretory cells).
- Basic Principles of Pharmacogenetics (a concurrent topic)
- Basic Principles of Pharmacokinetics (including: factors governing drug absorption, $t_{1/2}$, distribution volume, etc.)

Computer/Technology Requirements

The University of Minnesota computer requirements are listed here:

https://canvas.umn.edu/courses/162658

Course Goals & Objectives

COURSE CONCEPTS: GOALS & OBJECTIVES	Applicable domain & competency	Scientific Foundation
CONCEPT 1: Mechanism of Drug Action (MOA) Mechanism of Action (MOA) is how a drug works to effect change	**6.0, 6.1, 6.3.1, 6.4.2, 6.4.4**	**4.1.1, 4.1.2, 4.1.4, 4.1.3, 4.1.5**
OBJECTIVE 1.1: Explain the concepts of specificity and selectivity in drug action, the basic mechanisms of drug action, e.g. full, partial and inverse agonists, different types of antagonists, compare and contrast mechanisms of drug agonism and antagonism.	6.3.1, 6.4.2, 6.4.4	4.1.1, 4.1.2, 4.1.5
OBJECTIVE 1.2: Interpret concentration-effect curves.	6.0, 6.1, 6.3.1, 6.4.2, 6.4.4	4.1.5, 4.1.4
OBJECTIVE 1.3: Discuss the fundamentals of pharmacodynamics.	6.3.1, 6.4.2	4.1.1, 4.1.2, 4.1.3
OBJECTIVE 1.4: Give examples of drug-receptor interactions.	6.3.1, 6.4.2	4.1.1, 4.1.2, 4.1.5
OBJECTIVE 1.5: Use terminology associated with quantitative expression of drug effects.	6.3.1, 6.4.2	4.1.2, 4.1.5
OBJECTIVE 1.6: Describe signal transduction pathways associated with drug response.	6.3.1, 6.4.2, 6.4.4	4.1.1, 4.1.2, 4.1.5
OBJECTIVE 1.7: Describe general mechanisms of drug toxicity and treatment of poisoning.	6.4.2, 6.4.3, 6.4.4	4.3.1, 4.3.2, 4.3.4
CONCEPT 2: Target of Drug Action Target of action is the physiological location (e.g., cells, tissues, and system) that is affected by a drug.	**6.0, 6.1, 6.3.1, 6.4.2, 6.4.4**	**4.1.1, 4.1.2, 4.1.4, 4.1.5, 4.2.1,**
OBJECTIVE 2.1 Explain the pharmacological bases for drug-induced changes in cell function.	6.3.1, 6.4.2	4.1.1, 4.1.2, 4.1.4
OBJECTIVE 2.2: Apply the principles of potential mechanisms of action, at the molecular, cellular and tissue/systems levels with physiological targets to increase or decrease the inherent functions of various cells and tissues/systems.	6.0, 6.3.1, 6.4.2	4.1.1, 4.1.2, 4.1.4
OBJECTIVE 2.3: Differentiate drugs that can increase or decrease the inherent functions of various cells and tissues/system, i.e., targets of action.	6.0, 6.1, 6.3.1, 6.4.2, 6.4.4	4.1.1, 4.1.2, 4.1.5, 4.2.1
CONCEPT 3: Drug Response The response to a drug is also dependent on non-drug factors.	**6.1, 6.3, 6.3.1, 6.3.2, 6.3.3, 6.4.3, 6.4.4, 6.4.5, 6.4.6**	**4.1.4, 4.1.5, 4.1.6, 4.2.2**
OBJECTIVE 3.1: Describe how weight, physiological state, age, gender, genetics (see below), and different administration routes can affect drug response.	6.3, 6.3.1, 6.3.2, 6.3.3, 6.4.3	4.1.4, 4.1.5, 4.1.6
OBJECTIVE 3.2: Explain how pharmacogenetics/genomics (inherited genetic differences in drug metabolizing enzymes, drug transporters and drug targets) alter a drug's MOA(s), on- and off- target interactions, "drug-drug" interactions and drug response.	6.3, 6.3.1, 6.3.2, 6.4.2, 6.4.3, 6.4.5, 6.4.6	4.1.4, 4.1.5, 4.1.6, 4.2.1, 4.2.2, 4.2.3
OBJECTIVE 3.3: Discuss how pathological factors can affect drug response.	6.3, 6.3.1, 6.3.2, 6.4.3, 6.4.5, 6.4.6	4.1.4, 4.1.5, 4.1.6

CONCEPT 4: Drug-Drug Interactions Drugs may interact with each other when given concurrently.	**6.0, 6.1, 6.3**	**4.1.4, 4.1.5, 4.1.6**
OBJECTIVE 4.1: Distinguish between positive and negative drug interactions.	6.0, 6.1, 6.3	4.1.4, 4.1.5, 4.1.6
OBJECTIVE4.2: Describe cellular and systems level mechanisms that result in positive and negative drug interactions and articulate clinical examples of such interactions.	6.0, 6.1, 6.3	4.1.4, 4.1.5, 4.1.6
OBJECTIVE 4.3: Predict drug-drug interactions based on the drugs' MOA.	6.0, 6.1, 6.4.6	4.1.4, 4.1.6
CONCEPT 5: MOA and TOA in Therapy A drug's MOA and its target(s) of action define its use in therapy: Focus on histaminergic, eicosanoid, cholinergic and adrenergic pharmacology.	**6.0, 6.1, 6.3, 6.4 6.3.1, 6.4.2**	**4.1.1, 4.1.2, 4.1.4, 4.1.6, 4.2.1, 4.2.2, 4.2.3, 4.3.1, 4.3.2, 4.3.4**
OBJECTIVE 5.1: Discuss how selected autacoids (eicosanoids and histamine) and drugs that mimic or attenuate their actions can be exploited therapeutically.	6.3.1, 6.4.2	4.1.1, 4.1.2
OBJECTIVE 5.2: Explain how constitutive or induced production of various eicosanoids and/or related lipid mediators participate in (patho)physiology; and, based on this information, be able to predict potential deleterious effects related to drug-induced attenuation of these effects (i.e. deleterious effects of NSAIDs).	6.3.1, 6.4.2	4.1.4
OBJECTIVE5.3: Recognize and explain how "Autonomic" drugs may act to increase or decrease the functions of cardiac tissues, smooth muscles and glands and how these effects can be exploited therapeutically.	6.1, 6.4.2, 6.3.1	4.1.1, 4.1.2
OBJECTIVE 5.4: Predict off-target effects of "autonomic" drugs, antihistamines and NSAIDs.	6.4.2	4.1.1, 4.1.2, 4.1.4, 4.1.6
OBJECTIVE5.5: Discuss problems associated with overuse and off-target side effects of autonomic agents, antihistamines and NSAIDs and educate a patient or other health professional re: potential side effects that might attend the use of these agents.	6.3.1, 6.4.2	4.1.4, 4.3.2, 4.3.4
OBJECTIVE5.6: Explain how a drug works in a body (mechanism of action and target of action) to inform/guide effective communications with patients and other health professionals on its therapeutic use.	1.4., 6.3.1, 6.4.2	4.1.1, 4.1.2, 4.1.4

Competency Domains
Domain 1: Patient-Centered Care *As a provider of care, the pharmacist is ethical, benevolent, empathetic, competent, open-minded, prudent in making judgments, and devoted to serving others. The pharmacist applies knowledge, experience, and skills to protect the welfare of humanity. The pharmacist willingly and respectfully cares for patients to assure optimal therapeutic outcomes*
Domain 2: Population Health & Vulnerable Communities *As a promoter of public health, the pharmacist uses his/her expertise to partner with others to improve care for vulnerable communities or at risk populations. The pharmacist recognizes the differences between populations of individuals and seeks to alleviate disparities that exist.*
Domain 3: Health Systems Management *As a manager of health system resources, the pharmacist examines critical issues, assumptions, and limitations to produce and validate ways to deliver medications safely, effectively, and in a timely manner. The pharmacist demonstrates imagination, inventiveness, and courage by undertaking new endeavors to produce improved quality, productivity, efficiency, effectiveness, and innovation.*
Domain 4: Leadership & Engagement *In leading, the pharmacist demonstrates integrity and is habitually resolute, focused on excellence, knowledgeable about the "big picture," strategic, focused, persuasive, open to feedback, decisive, visionary, empowering, and service-oriented.*
Domain 5: Professional & Interprofessional Development *When collaborating, the pharmacist demonstrates critical thinking, excellent communication and leadership, and is goal-oriented, cooperative, assertive, respectful, enthusiastic, and reliable. The pharmacist consistently and consciously demonstrates high ethical and moral standards by considering how and when to act, acting in a manner that is clearly consistent with those standards and exercising accountability for those actions.*
Domain 6: Knowledge, Scientific Inquiry, and Scholarly Thinking *In making use of scientific knowledge, the pharmacist explains with thoroughly researched, evidence based accounts of facts and data, and provides interpretations based on analysis of the importance, meaning, and significance. The pharmacist applies knowledge fluently, flexibly, and efficiently in diverse contexts.*

Attendance Policy

Students are expected to attend every class for which they are registered. Students are expected to attend classes on the campus where they are enrolled. Instructors may choose to take attendance. Students are responsible for making up missed content during absence from lecture.

Course Materials

Required (or Optional) Text, eReserve, or Materials

The following materials are recommended (optional) in this course:

- Rang and Dale's Pharmacology, 8th Edition, Rang et al.
- Goodman & Gilman's The Pharmacological Basis of Therapeutics, 12th Edition, Brunton et al. *(Free online through the UM Biomedical Library)*

Assessments & Grading

Graded Assessments

The following graded assessments will count toward your final grade for this course in the following percentages. **All assessments may contain multiple choice, true/false and short answer questions.**

#		Title Brief description	Assessment Goal Assess COURSE OBJECTIVES :	Points	% of final grade
1		Quizzes I-IV			
		- Out of class, due in 48 hours from start - Individual effort - Open Book	Quiz 1 Quiz 2 Quiz 3 Quiz 4		**8%** **8%** **8%** **8%**
2		EXAMS I-IV - 60 min - in class, individual effort	Exam 1 Exam 2 Exam 3 Exam 4		**12%** **12%** **12%** **12%**
3		Student-generated questions			**4%**
4		Group activity on autonomic pharmacology			**4%**
5		CUMULATIVE FINAL EXAM, 3 hours, in class	All course concepts		**12%**
		TOTAL			**100%**

Exam Policy

During the course there will be 4 non-cumulative multiple-choice quizzes and exams plus one cumulative multiple-choice exam administered in class at the end of the course. Multiple choice exam questions will be based on the course content listed under "Detailed Course Outline & Schedule". Qizzes and Exams I-IV will contain approximately three (3) and five (5) questions per lecture hour, respectively and test the 5 units/course goals. The cumulative final exam will contain approximately two (2) questions per lecture hour covering all course topics. Thus, by the end of the course there will be approximately six (6) questions for every hour of lecture. The final percentile score in the course is equal to the total points obtained on all exams, quizzes, team projects, contribution to exam question ÷ total possible points x 100.

Absence from Exams, Quizzes, and Team Projects

Students are required to take exams, quizzes, and participate in team projects at the time scheduled. Make-up exams, quizzes, team project presentations will not be given. When an absence is excused (see below), the portion of the cumulative final exam that relates to the content of the missed exam or quiz will be counted as a makeup exam/quiz.

Absence from a team project will require the student to write an essay about the assigned project (minimum of 2 pages) within a reasonable time frame, which must be agreed upon with the Course Director. The makeup essay will be graded; points earned for the makeup essay can be no more than those earned by the team for the presented project.

Absence from exam, quiz, team project with acceptable cause

Absence from an exam, quiz, or team project will be excused under certain circumstances including verified illness, family emergency, and certain University/College of Pharmacy-sponsored events. If a student is unable for any reason to take an exam, quiz, or team project, the student must contact the Course Director or the Office of Student Services by email or phone *prior* to the exam, quiz, or team project. The student must provide the Course Director with a written and signed statement from a licensed health care provider (i.e., physician, nurse practitioner or physician assistant) that explains the reason for absence.

Absence for other reasons (non-medical, non-emergency, non-University/College of Pharmacy-sponsored events) must be discussed with and accepted by the Course Director prior to the exam, quiz, or team project.

Absence from exam, quiz, team project without acceptable cause

Unexcused absence from an exam, quiz and/or team project will result in a score of zero.

Final grades will be rounded to the nearest whole number using common rounding rules (as per Microsoft Excel® where values ≥ 0.5 are rounded up).

Grading Information

Course Letter Grades

Grade	Percentage
A	93.0 - 100
A-	90.0 - 92.9
B+	87.0 - 89.9
B	83.0 - 86.9
B-	80.0 - 82.9
C+	77.0 - 79.9
C	73.0 - 76.9
C-	70.0 - 72.9
D	60.0 - 69.9
F	0 - 59.9

Disability and Mental Health statement:

The University of Minnesota is committed to providing equitable access to learning opportunities for all students. Disability Services (DS) is the campus office that collaborates with students who have disabilities to provide and/or arrange reasonable accommodations. If you have, or think you may have, a disability (e.g., mental health, attentional, learning, chronic health, sensory, or physical), please contact DS at 612-626-1333 to arrange a confidential discussion regarding equitable access and reasonable accommodations. If you are registered with DS and have a current letter requesting reasonable accommodations, we encourage you to contact course directors early in the semester to review how the accommodations will be applied in the course.

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating, and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce your ability to participate in daily activities. University of Minnesota services are available to assist you with addressing these and other concerns you may be experiencing. You can learn more about the broad range of confidential mental health services available on campus via www.mentalhealth.umn.edu <http://ecommunication.umn.edu/t/407738/37315516/23351/0/>.

University of Minnesota and College of Pharmacy Policy Reference (Centralized Syllabus)
This page includes all required UMN and CoP policies, e.g., Academic Freedom; Copyright; Course Evaluations; Disability Accommodations; FERPA, etc.

Integrated Schedule- Spring 2020

PHAR 6722 – PRINCIPLES OF MEDICINAL CHEMISTRY and PHAR 6726 – PRINCIPLES OF PHARMACOLOGY

DATE	DAY	TIME	PLACE	TOPIC	COURSE	INSTRUCTOR
1/17	F	1:25-2:15	1-450 MT 163 LS	Course Introduction Medicinal Chemistry and Drug Discovery-1	Phar 6722	Tretyakova Aldrich
1/17	F	2:30-3:20	1-450 MT 163 LS	Introduction; Fundamentals of Drug Action / Receptor Theory	Phar 6726	El-Fakahany
1/21	Tu	10:10-11:00	7-135 WDH Lib410	Receptors as Drug Targets; Drug-receptor Interactions	Phar 6726	El-Fakahany
1/21	Tu	11:15-12:05	7-135 WDH Lib410	Receptors as Drug Targets and Allosteric Modulation Why Pharmacology for Pharmacists?	Phar 6726	El-Fakahany Klein
1/22	W	2:30-3:20	1-450 MT 163 LS	Basics in drug discovery-2	Phar 6722	Aldrich
1/22	W	3:35-4:25	1-450 MT 163 LS	Signal Transduction	Phar 6726	Klein
1/24	F	1:25-2:15	1-450 MT 163 LS	Basics in drug discovery-3	Phar 6722	Aldrich
1/24	F	2:30-3:20	1-450 MT 163 LS	Channel-linked and Enzyme-linked Receptors	Phar 6726	Klein
1/28	Tu	10:10-11:00	7-135 WDH Lib410	NO class-CPF	Phar 6722	
1/28	Tu	11:15-12:05	7-135 WDH Lib410	NO class-CPF	Phar 6726	
1/29	W	2:30-3:20	1-450 MT 163 LS	Basics in drug discovery-4 **Problem Set 1 Due**	Phar 6722	Aldrich
1/29	W	3:35-4:25	1-450 MT 163 LS	Receptor Regulation	Phar 6726	Klein
1/31	F	1:25-2:15	1-450 MT 163 LS	Basics in drug discovery-5	Phar 6722	Aldrich
1/31	F	2:30-3:20	1-450 MT 163 LS	Basics in drug discovery-6	Phar 6722	Aldrich
2/4	Tu	10:10-11:00	7-135 WDH Lib410	Basics in drug discovery-7	Phar 6722	Aldrich
2/4	Tu	11:15-12:05	7-135 WDH Lib410	**Principles of Pharmacology – Review and Quiz 1 Due**	Phar 6726	El-Fakahany, Klein
2/5	W	2:30-3:20	1-450 MT 163 LS	**Principles of Pharmacology – EXAM 1**	Phar 6726	El-Fakahany, Klein
2/5	W	3:35-4:25	1-450 MT 163 LS	Basics in drug discovery-8	Phar 6722	Aldrich
2/7	F	1:25-2:15	1-450 MT 163 LS	Basics in drug discovery-9	Phar 6722	Aldrich
2/7	F	2:25-3:20	1-450 MT 163 LS	Prodrugs	Phar 6722	Mereddy
2/11	Tu	10:10-11:00	7-135 WDH Lib410	Prodrugs and Chelating Agents: Therapeutic Agents	Phar 6722	Mereddy
2/11	Tu	11:15-12:05	7-135 WDH	Chelating Agents: Diagnostic/imaging Agents	Phar 6722	Mereddy

			Lib410			
2/12	W	2:30-3:20	1-450 MT 163 LS	Principles of Medicinal Chemistry – Review **Problem Set 2 Due**	Phar 6722	Aldrich, Mereddy
2/12	W	3:35-4:25	1-450 MT 163 LS	Introduction to Drug Metabolism: Phase I and Phase II Drug Metabolism	Phar 6722	Tretyakova
2/14	F	1:25-2:15	1-450 MT 163 LS	**Principles of Medicinal Chemistry – Exam 1**	Phar 6722	Aldrich, Mereddy
2/14	F	2:30-3:20	1-450 MT 163 LS	Cytochrome P450 Monooxygenases	Phar 6722	Tretyakova
2/18	Tu	10:10-11:00	7-135 WDH Lib410	Cytochrome P450 Monooxygenases	Phar 6722	Tretyakova
2/18	Tu	11:15-12:05	7-135 WDH Lib410	Pharmacokinetics	Phar 6726	L. Johnson
2/19	W	2:30-3:20	1-450 MT 163 LS	Phase I Metabolism: Aliphatic Oxidation	Phar 6722	Tretyakova
2/19	W	3:35-4:25	1-450 MT 163 LS	Effects of DDI on Pharmacokinetics	Phar 6726	L. Johnson
2/21	F	1:25-2:15	1-450 MT 163 LS	Phase I Metabolism: Oxidation of Unsaturated Bonds; Aromatic Oxidation	Phar 6722	Tretyakova
2/21	F	2:30-3:20	1-450 MT 163 LS	Pharmacokinetics Case Studies	Phar 6726	L. Johnson
02/25	Tu	10:10-11:00	7-135 WDH Lib410	Phase I Metabolism: N-oxidation Metabolic Reductions	Phar 6722	Tretyakova
02/25	Tu	11:15-12:05	7-135 WDH Lib410	Metabolism Recitation Session	Phar 6722	Tretyakova
2/26	W	2:30-3:20	1-450 MT 163 LS	Phase II Metabolism: Acetylation	Phar 6722	Tretyakova
2/26	W	3:35-4:25	1-450 MT 163 LS	Introduction to Pharmacogenomics – Overview, Implementation and Ethics	Phar 6726	Jacobson
2/28	F	1:25-2:15	1-450 MT 163 LS	Phase II Metabolism: Methylation. GSH conjugation	Phar 6722	Tretyakova
2/28	F	2:30-3:20	1-450 MT 163 LS	Ethical, Social, Legal & Economic Issues in Pharmacogenomics: Implementation	Phar 6726	Stratton
				TBD-Metabolism recitation		
3/3	Tu	10:10-11:00	7-135 WDH Lib410	Metabolism Review **Problem Set 3 Due**	Phar 6722	Tretyakova
3/3	Tu	11:15-12:05	7-135 WDH Lib410	Effect of Genetic Variation on Pharmacokinetics	Phar 6726	Jacobson
3/4	W	2:30-3:20	1-450 MT 163 LS	Principles of Medicinal Chemistry **Exam 2**	Phar 6722	Tretyakova
3/4	W	3:35-4:25	1-450 MT 163 LS	Effect of Genetic Variation on Adverse Drug Reactions	Phar 6726	Jacobson
3/6	F	1:25-2:15	1-450 MT 163 LS	**OPEN**	Phar 6722	
3/6	F	2:30-3:20	1-450 MT 163 LS	Pharmacogenomics Case Studies	Phar 6726	Jacobson
				March 9-13 Spring Break		
3/17	Tu	10:10-	7-135	Eicosanoid Biosynthesis	Phar 6722	Doran

		11:00	WDH Lib410			
3/17	Tu	11:15-12:05	7-135 WDH Lib410	**Principles of Pharmacology – Review and Quiz 2 Due**	Phar 6726	Jacobson, L. Johnson, Stratton
3/18	W	2:30-3:20	1-450 MT 163 LS	**Principles of Pharmacology – EXAM 2**	Phar 6726	Jacobson, L. Johnson, Stratton
3/18	W	3:35-4:25	1-450 MT 163 LS	Eicosanoid Biosynthesis Inhibitors and Receptor Ligands	Phar 6722	Doran
3/20	F	1:25-2:15	1-450 MT 163 LS	General Mechanisms of Drug Toxicity	Phar 6726	K. Sioris
3/20	F	2:30-3:20	1-450 MT 163 LS	General Mechanisms of Drug Toxicity	Phar 6726	K. Sioris
3/24	Tu	10:10-11:00	7-135 WDH Lib410	Eicosanoid Biology - Background	Phar 6726	Kim
3/24	Tu	11:15-12:05	7-135 WDH Lib410	Pharmacology of Eicosanoids	Phar 6726	Kim
3/25	W	2:30-3:20	1-450 MT 163 LS	Eicosanoid Biosynthesis Inhibitors and Receptor Ligands	Phar 6722	Doran
3/25	W	3:35-4:25	1-450 MT 163 LS	Non-Steroidal Antiinflammatory Agents	Phar 6726	Klein
3/27	F	1:25-2:15	1-450 MT 163 LS	Histamine H1 Receptor Antagonists	Phar 6722	Doran
3/27	F	2:30-3:20	1-450 MT 163 LS	Histamine, Histamine Receptors, Histamine Effects	Phar 6722	Doran
3/31	Tu	10:10-11:00	7-135 WDH Lib410	Histamine H2 Receptor Antagonists and Proton Pump Inhibitors **Problem Set 4 Due**	Phar 6722	Doran
3/31	Tu	11:15-12:05	7-135 WDH Lib410	**OPEN**		
4/1	W	2:30-3:20	1-450 MT 163 LS	Introduction to Autonomic Pharmacology - Physiology	Phar 6726	Zordoky, El-Fakahany
4/1	W	3:35-4:25	1-450 MT 163 LS	Introduction to Autonomic Pharmacology - Physiology	Phar 6726	Zordoky
4/3	F	1:25-2:15	1-451 MT 163 LS	**Principles of Medicinal Chemistry – EXAM 3**	Phar 6722	Doran
4/3	F	2:30-3:20	1-451 MT 163 LS	Introduction to Autonomic Pharmacology - Physiology	Phar 6726	Zordoky
4/7	Tu	10:10-11:00	7-135 WDH Lib410	Adrenergic Agents: Catecholamine Synthesis and Metabolism	Phar 6722	Mereddy
4/7	Tu	11:15-12:05	7-135 WDH Lib410	**Principles of Pharmacology – Review and Quiz 3 Due**	Phar 6726	Kim, Klein, Zordoky, El-Fakahany, Sioris
4/8	W	2:30-3:20	1-450 MT 163 LS	Sympathomimetics	Phar 6722	Mereddy
4/8	W	3:35-4:25	1-450 MT 163 LS	Sympathomimetics	Phar 6726	Zordoky
4/10	F	1:25-2:15	1-450 MT 163 LS	**Principles of Pharmacology – EXAM 3**	Phar 6726	Kim, Klein, Zordoky, El-Fakahany, Sioris

4/10	F	2:30-3:20	1-450 MT 163 LS	Adrenergic Receptor Blocking Drugs	Phar 6722	Mereddy
4/14	Tu	10:10-11:00	7-135 WDH Lib410	Adrenoceptor Antagonists	Phar 6726	Zordoky
4/14	Tu	11:15-12:05	7-135 WDH Lib410	Adrenoceptor Antagonists and Adrenergic Neuronal Blocking Agents	Phar 6726	Zordoky
4/15	W	2:30-3:20	1-450 MT 163 LS	Acetylcholine Synthesis, Release and Inhibition of Release	Phar 6722	Mereddy
4/15	W	3:35-4:25	1-450 MT 163 LS	Acetylcholinesterase and its Inhibition	Phar 6722	Mereddy
4/17	F	1:25-2:15	1-450 MT 163 LS	Muscarinic and Nicotinic Receptor Ligands **Problem Set 5 Due**	Phar 6722	Mereddy
4/17	F	2:30-3:20	1-450 MT 163 LS	Muscarinic Agonists	Phar 6726	El-Fakahany
4/21	Tu	10:10-11:00	7-135 WDH Lib410	Muscarinic Antagonists	Phar 6726	El-Fakahany
4/21	Tu	11:15-12:05	7-135 WDH Lib410	Muscarinic Antagonists	Phar 6722	El-Fakahany
4/22	W	2:30-3:20	1-450 MT 163 LS	Autonomic Agents: Student Group Activities /Presentations	Phar 6726	Kim, El-Fakahany, Zordoky,
4/22	W	3:35-4:25	1-450 MT 163 LS	Autonomic Agents: Student Group Activities /Presentations	Phar 6726	Kim, El-Fakahany, Zordoky
4/24	F	1:25-2:15	1-450 MT 163 LS	**Principles of Medicinal Chemistry – EXAM 4**	Phar 6722	Mereddy
4/24	F	2:30-3:20	1-450 MT 163 LS	**Principles of Pharmacology –Review and Quiz 4 Due**	Phar 6726	El-Fakahany, Kim, Zordoky
4/28	Tu	10:10-11:00	7-135 WDH Lib410	**OPEN**		
4/28	Tu	11:15-12:05	7-135 WDH Lib410	**OPEN**		
4/29	W	2:30-3:20	1-450 MT 163 LS	**Principles of Pharmacology – EXAM 4**	Phar 6726	Kim, Zordoky, El-Fakahany
4/29	W	3:35-4:25	1-450 MT 163 LS	**OPEN**		
				No Class 5/1 – Pharmacy Day		
5/5	Tu	1:25-2:15	1-450 MT 163 LS	Medicinal Chemistry Final Exam Review Session	Phar 6722	Aldrich, Tretyakova, Mereddy, Doran
5/5	Tu	2:30-3:20	1-450 MT 163 LS	Pharmacology Final Exam Review Session	Phar 6726	
FINALS WEEK				**Comprehensive Medicinal Chemistry FINAL EXAM**	Phar 6722	
FINALS WEEK				**Comprehensive Pharmacology FINAL EXAM**	Phar 6726	

Phar6726: Student Generated Question Activity

'Student-generated questions' created by students to help demonstrate their understanding of the material being covered. These are often considered questions with specific answers based from the material, similar to ones that would be found on an exam or quiz. Some of the student-generated questions submitted will be selected by the instructors and posted on the Moodle site before the exam. These questions will also be embedded into the following exam, allowing students to practice their knowledge and reduce the high-stakes nature of each exam.

One student-generated question will be generated based on the lecture material covered for each exam (1 per exam). Each question will be submitted by 5pm several days before the Exam (see table below for dates). Each question submission should be either a word (.doc or .docx) or pdf (.pdf) file and will be submitted by a designated 'drop box' located on the Canvas site. Alternative file types that are non-readable by the instructors or TAs (e.g. google doc, apple page) may result in a grade of 'zero'. Submissions by email to the course instructors/TAs will NOT be accepted.

Date of Exam	Date Due
February 5	February 1
March 18	March 14
April 10	April 6
April 29	April 25

Criteria for full credit:

- Multiple choice format with at least 4 answer choices (i.e. A, B, C, and D)
- Should be of quality and caliber of a first year Pharmacy student.
- Correct answers should be either **bolded** or highlighted.
- Answer choices may include "none of the above" or "all of the above".
- No credit will be given if one of the answer choices include "at least one of the above" or "two of the above" etc..

Examples of Acceptable Questions:

1. Which of the following is the action of cocaine in the adrenergic system?
    a. Bind selectively to α-adrenoceptors
    b. Bind selectively to β-adrenoceptors
    c. Prevent reuptake of norepinephrine from the synapse
    d. Promote fusion of neuronal vesicle with cell membrane

2. Which of the following is *not* a contraindication for use of a muscarinic acetylcholine agonist?
    a. Asthma
    b. COPD
    c. Glaucoma
    d. Peptic ulcer

3. Which of the following an example of a G-protein coupled receptor?
    a. mGluR
    b. Muscarinic acetylcholine receptor
    c. $GABA_B$
    d. All of the above

Example of an Inacceptable Question:

4. Which of the following prostaglandin receptors increase cAMP levels (e.g. Gαs)?
    a. EP2
    b. EP4
    c. EP1
    d. EP3
    e. At least two of the above

Why is this question not acceptable? Answer choices includes “at least two of the above” (and no correct answer was identified)