# Biology 3AA3
# Fundamental Concepts of Pharmacology
# Winter 2021 Course Outline

## Course Details

**Instructor:** Dr. Joanna Wilson, joanna.wilson@mcmaster.ca, 905-525-9140 x 20075 (office telephone)

**Office hours:** Mondays 10:30 am-12:00 pm; Life Sciences Building Room 526

**TAs:** TBD

**Lectures:** Mondays 930 am- 10:20 am, Location To Be Determined
Tuesdays 10:30 am – 11:20 am, Location To Be Determined
Thursdays 930 am- 10:20 am, Location To Be Determined

**Tutorials:** TBD

## Course Description

Drug interactions with living organisms; absorption and elimination of drugs, variations in drug action, drug toxicity, receptor structure and function, and signal transduction pathways.
Three lectures, one tutorial (three hours); one term
Prerequisite(s): BIOLOGY 2A03; and one of BIOCHEM 2BB3, 2EE3, ISCI 2A18 A/B, or registration in BIOCHEM 3G03. BIOLOGY 3P03 is strongly recommended.
*Not open to students with credit in BIOCHEM 4Q03 or registration in Honours Biology and Pharmacology.*

This course examines the fundamentals of pharmacology as a science. Special topics will include the drug discovery/development process, environmental issues in human drugs and the use of herbal medications as pharmaceutical products. The course will be organized in weekly lectures and tutorials. Students will have class discussions and assignments in tutorial; a group project and presentation will be at the end of term. Tests will be scheduled in class time.

## Course Learning Objectives

Students will learn the fundamentals of:

1. pharmacokinetics (drug absorption, distribution, metabolism, elimination),
2. pharmacodynamics (drug targets, drug receptor targets and second messengers, efficacy, potency, drug response relationships
3. toxicology (adverse drug responses, therapeutic window)
4. drug development (drug discovery, pre-clinical studies, clinical studies, post-marketing surveillance)

5. environmental issues in human pharmaceuticals (human drugs in the environment, effects of human drugs on non-target species, antibiotic resistance)
6. herbal drugs (herbal medication, herb-drug interactions) & over the counter medication (safety margins for over the counter medications)

Students will be able to describe the major mechanisms that control pharmacokinetics and pharmacodynamics. Students will be expected to interpret pharmacological data and perform data analyses of pharmacological experiments. Students will be able to describe the drug discovery process and identify the major barriers to new drugs on the market. Students will read and interpret scientific publications in pharmacology. Students will gain presentation skills.

## Course Schedule

**Lecture and Tutorial Schedule:**

Week 1 Jan 7– Introduction
No Tutorial This Week
Week 2 Jan 11, 12, 14 – Pharmacokinetics I, II, III
No Tutorial This Week
Week 3 Jan 18, 19, 21 – Pharmacokinetics IV, V, VI
Tutorial 1: Routes of drug administration (Assignment)
Week 4 Jan 25, 26, 28 - Pharmacokinetics VII, VIII, REVIEW lecture
Tutorial 2: Drug absorption, pKa and pH (Assignment)
Week 5 Feb 1 - MID TERM TEST 1 (Pharmacokinetics, 20% of grade)
Feb 2 - Pharmacodynamics I
Feb 4 - Pharmacodynamics II
Tutorial 3: Cytochrome P450 Mediated Drug Metabolism (Assignment)
Week 6 Feb 8, 9, 11 - Pharmacodynamics III, IV, V
Tutorial 4: Drug interactions (Paper and discussion, Quiz)
Week 7 Feb 15-19 Reading week
Week 8 Feb 22, 23, 25 –Toxicology I, II, III
Tutorial 5: Dose response curves: efficacy, potency (Assignment)
Week 9 March 1- REVIEW Lecture
March 2 - MID TERM TEST 2 (Pharmacodynamics, Toxicology, 20% of grade)
March 4 –Drug Development I
Tutorial 6: Agonists and antagonists (Assignment);
Assign presentations, group contracts
Week 10 March 8, 9, 11 – Drug Development II, III, Herbal & Over the Counter Medication
Tutorial 7: Therapeutic index, drug safety (Assignment); Presentation tips
Week 11 March 15, 16, 18 –Pharmaceuticals in the Environment I, II, III
Tutorial 8: Drug costs (Paper and discussion, Quiz); Annotated bibliographies
Week 11 March 22 - REVIEW lecture
March 23 – MIDTERM TEST 3 (Drug Development, Herbal & OTC medication, Pharmaceuticals in the Environment, 20% of grade)
Tutorial 9: Drugs in the environment (Paper and discussion, Quiz)

Group Presentations: Start in Week 11 Lecture slots
Week 11 March 25
Week 12 March 29, 30, April 1
Week 13 April 5, 6, 8

**IMPORTANT NOTE**

*The instructor and university reserve the right to modify elements of the course during the term. The university may change the dates and deadlines for any or all courses in extreme circumstances. If any modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes. It is the responsibility of the student to check their McMaster email and course websites weekly during the term and to note any changes. Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, Avenue to Learn and/or McMaster email.*

## Course Materials

**Optional Textbook:**
The optional textbook for this course is *Pharmacology: Principles and Practice* by Miles Hacker, Kenneth Bachmann and William Messer. This is available in the campus bookstore for purchase.

Students are welcome to use other textbooks to support their learning in the course. The McMaster University libraries (especially Health Sciences Library) have a number of good quality text books on pharmacology (e.g. Katzung, Kalant, Goodman and Gillman, Rang and Dale etc) that will support the learning in this course. However, many of these texts provide the material using an organ based system (e.g. drugs for cardiovasculature, drugs for renal function…) and the course is not taught by organ system. Students will need to use a variety of texts to support their learning in this course as not all topics are in every textbook.

## Course Evaluation

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| All Assignments: | 20% | Assigned in tutorials, weekly |
| Mid terms & exam: | 40-60% | 3 test @ 20% each.<br>3 tests plus one exam; top 3 marks count.<br>See missed work section for how tests are handled<br>February 1, March 2, March 23 |
| Presentation: | 20% | Group project; March 25-April 8 as scheduled |
| Exam: | 0-20% | Optional if you have completed all 3 midterms<br>Offer 3 midterms plus one exam, top 3 marks count.<br>Required if you have missed a midterm, please see missed work section for details |
| Total Marks | 100% | |

**Group Presentations:** 20% (15% presentation, 5% annotated bibliography)
To be completed in groups of 2-4 students. Groups will be assigned in tutorial.

Students will provide a presentation in class on the pharmacokinetics, pharmacodynamics OR toxicology of a specific drug. Presentations will be no more than 12 minutes long, with 3 minutes for class discussion and questions. Students will prepare a powerpoint file (or pdf from another software platform) to support their presentation. Students will upload the presentation to Avenue to Learn (due by 9 am on the day of the presentation) so that the presentations can be uploaded at the beginning of class.

Students will be assigned to a group within their tutorial section. Students will be assigned a drug and topic (pharmacokinetics, pharmacodynamics, or toxicology) from a list provided during week 8 tutorials.

Students will hand in an annotated bibliography on the day of their presentation that documents their sources and what they used these sources for.

Students will be given a group grade on the presentation and annotated bibliography. Students will complete a Group Partner Evaluation Form and marks may be adjusted based on these evaluation forms and TA discretion, for individual group members, if the group work is not shared equally by all group members. Group member contracts are provided for those groups who wish to use them. At minimum, groups need to specify tasks assigned to each group member and document this distribution to their TA.

In-class discussion is a vital portion of these presentations. Student participation will be noted ***and students may receive up to a 5% bonus to their presentation grade for participation in the discussion.*** Participation will be graded by the TAs, based on both the quantity and quality of the questions and discussion.

***The content of the group presentations will be tested on the final exam.*** Students are expected to attend the lecture slots where students are presenting their research. Slides will be shared with the class for study purposes.

**Tutorials: Start in Week 3, 20% of grade**

Students are expected to attend every tutorial and be prepared to complete the tutorial assignments. Tutorials are a combination of review sessions and tutorials. The content is directly tied to what is discussed in class. Tutorial sheets are made available on Avenue to Learn for students to print off and bring to tutorial session. Semi-log graph paper is also available for some tutorials. Please bring materials to class. You are welcome to bring a calculator with you.

**Tutorial Formats:**

Format 1 – in class exercise and assignment. Students will complete exercise in class and hand in to TA for marking before they leave tutorial. Assignments completed in pencil will not be re-graded; only those completed in pen may be re-graded. Students are expected to complete the assignment individually. Each assignment (6 assignments total in week 2,3,4, 6, 8 and 9) is worth 2.5% = 15% of course grade.

Format 2 – in class discussion. Students will be expected to read the paper prior to coming to class (paper is identified on the tutorial sheet). Students will answer a short quiz on the paper at the beginning of the class and then have a discussion of the paper. Students will be expected to participate and marked by the TA on their participation in these discussions. Each quiz (3 quizzes in week 5, 10, and

11) is worth 1% = 3% of course grade. Participation in the class discussions of these papers is worth 2%, based on participation in all three tutorial discussions.

There are eight tutorial exercises in week 2-11 of the course. After that, students will use the tutorial sessions to plan their group presentation and meet with their TAs to discuss their progress.

**Term Tests:** Students are expected to write all three tests and appropriate documentation is expected for missed tests. If a test is missed with appropriate documentation, the final exam must be written. If all three tests are completed, the student is not required to write the final exam, unless they would like to offset a lower grade on one mid-term. Only the top 3 grades from the four assessments (3 tests + 1 final exam) will be counted towards the final course grade.

**Exam:**
A final exam, scheduled by the registrar, will be at the end of term. The final is optional if students have completed all three midterms. If students have needed to use an MSAF to miss a midterm, they will be required to write the final exam. If students have completed all the midterms and choose to write the final, the lowest grade will dropped. The final exam will focus on the content of the group presentations. McMaster approved calculators may be brought into the exam.

## Academic Integrity

You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity. **It is your responsibility to understand what constitutes academic dishonesty.**

Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: "Grade of F assigned for academic dishonesty"), and/or suspension or expulsion from the university. For information on the various types of academic dishonesty please refer to the *Academic Integrity Policy*, located at https://secretariat.mcmaster.ca/university-policies-procedures- guidelines/

The following illustrates only three forms of academic dishonesty:

- plagiarism, e.g. the submission of work that is not one's own or for which other credit has been obtained.
- improper collaboration in group work.
- copying or using unauthorized aids in tests and examinations.

## Authenticity/Plagiarism Detection

***Some courses may*** use a web-based service (Turnitin.com) to reveal authenticity and ownership of student submitted work. For courses using such software, students will be expected to submit their work electronically either directly to Turnitin.com or via an online learning platform (e.g. Avenue to Learn, etc.) using plagiarism detection (a service supported by Turnitin.com) so it can be checked for academic dishonesty.

Students who do not wish their work to be submitted through the plagiarism detection software must inform the Instructor before the assignment is due. No penalty will be assigned to a student who does not submit work to the plagiarism detection software. **All submitted work is subject to normal verification that standards of academic integrity have been upheld** (e.g., on-line search, other software, etc.). For more details about McMaster's use of Turnitin.com please go to www.mcmaster.ca/academicintegrity.

## Courses with an On-line Element

***Some courses may*** use on-line elements (e.g. e-mail, Avenue to Learn, LearnLink, web pages, capa, Moodle, Echo360, Microsoft Teams, ThinkingCap, etc.). Students should be aware that, when they access the electronic components of a course using these elements, private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in a course that uses on-line elements will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure please discuss this with the course instructor.

## Online Proctoring

**Some courses may** use online proctoring software for tests and exams. This software may require students to turn on their video camera, present identification, monitor and record their computer activities, and/or lock/restrict their browser or other applications/software during tests or exams. This software may be required to be installed before the test/exam begins.

## Conduct Expectations

As a McMaster student, you have the right to experience, and the responsibility to demonstrate, respectful and dignified interactions within all of our living, learning and working communities. These expectations are described in the *Code of Student Rights & Responsibilities* (the "Code"). All students share the responsibility of maintaining a positive environment for the academic and personal growth of all McMaster community members, **whether in person or online.**

It is essential that students be mindful of their interactions online, as the Code remains in effect in virtual learning environments. The Code applies to any interactions that adversely affect, disrupt, or interfere with reasonable participation in University activities. Student disruptions or behaviours that interfere with university functions on online platforms (e.g. use of Avenue 2 Learn, WebEx, Echo360, Microsoft Teams or Zoom for delivery), will be taken very seriously and will be investigated. Outcomes may include restriction or removal of the involved students' access to these platforms.

## Academic Accommodation of Students with Disabilities

Students with disabilities who require academic accommodation must contact Student Accessibility Services (SAS) at 905-525-9140 ext. 28652 or sas@mcmaster.ca to make arrangements with a Program Coordinator. For further information, consult McMaster University's *Academic Accommodation of Students with Disabilities* policy.

## Requests for Relief for Missed Academic Term Work

McMaster Student Absence Form (MSAF): In the event of an absence for medical or other reasons, students should review and follow the Academic Regulation in the Undergraduate Calendar "Requests for Relief for Missed Academic Term Work".

View the McMaster Student Absence Form (MSAF) for more information.

## Academic Accommodation for Religious, Indigenous or Spiritual Observances (RISO)

Students requiring academic accommodation based on religious, indigenous or spiritual observances should follow the procedures set out in the RISO policy. Students should submit their request to their Faculty Office ***normally within 10 working days*** of the beginning of term in which they anticipate a need for accommodation or to the Registrar's Office prior to their examinations. Students should also contact their instructors as soon as possible to make alternative arrangements for classes, assignments, and tests.

## Copyright and Recording

Students are advised that lectures, demonstrations, performances, and any other course material provided by an instructor include copyright protected works. The Copyright Act and copyright law protect every original literary, dramatic, musical and artistic work, **including lectures** by University instructors

The recording of lectures, tutorials, or other methods of instruction may occur during a course. Recording may be done by either the instructor for the purpose of authorized distribution, or by a student for the purpose of personal study. Students should be aware that their voice and/or image may be recorded by others during the class. Please speak with the instructor if this is a concern for you.

## Extreme Circumstances

The University reserves the right to change the dates and deadlines for any or all courses in extreme circumstances (e.g., severe weather, labour disruptions, etc.). Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, Avenue to Learn and/or McMaster email.