

# HONOURS BIOLOGY & PHARMACOLOGY COOP PROGRAM

Faculty of Health Sciences

PHARMAC 3A06  
(2023-2024)

## **INTRODUCTION TO PHARMACOLOGY**

Course  
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## PHARMACOLOGY 3A06

This full year course will be run in a [problem-based format](#).

The central tenet of this course is that learning is more efficient within the context of small groups that are largely self-directed. There are clear objectives which ensure that the course though self-directed is not self-willed. These objectives have been set for each problem; the objectives set are those we feel are the minimum that each group must meet.

The **objectives** of this course are twofold:

**Process objectives** (HOW to learn)

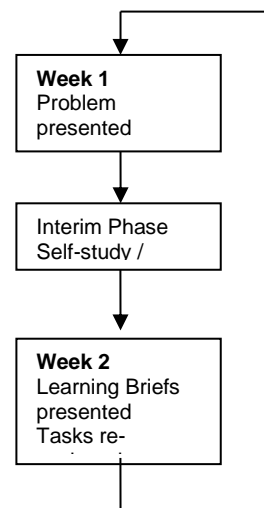
and

**Content objectives** (WHAT to learn)

**Process objectives:** In this format of learning, the cases, problems or scenarios act as starting points for exploration. You would acquire the skills necessary to use such problems to further your knowledge of the discipline. Thus given a problem in pharmacology, you would learn to generate issues/organize relevant issues into learning tasks/seek appropriate information from a variety of sources (texts, journals, individuals), analyze critically the information obtained, synthesize the information into a coherent framework, share the information obtained, facilitate the learning of others in the group, assess your performance as well as those of the others (see Figure).

**Content Objectives:** Content objectives for Term 1 cover the basic principles of the two major divisions of experimental pharmacology which are PHARMACODYNAMICS and PHARMACOKINETICS and are as follows:

- **Dose- and concentration-response relations**
  - **Graded and quantal responses**
  - **Potency & efficacy**
  - **Therapeutic and toxic effects of drugs**
  - **Drug receptors: their classification and experimental definition**
  - **Agonists (the dimensions of agonism) & antagonists**
  - **Receptor-response coupling**
  - **Non-receptor mediated effects of drugs**
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- **Absorption, distribution, biotransformation, excretion of drugs**
  - **Orders of reaction (first, zero orders)**
  - **Routes of administration**
  - **Different formulations**
  - **Bioequivalence**
  - **Definition and measurement of pharmacokinetic variables such as volumes of distribution, elimination rates, half-lives and areas under the curve**



In Term 2 you will apply what you have learned in Term 1 to satisfy content objectives about specific categories of drugs:

- **Drugs acting on the central nervous system**
- **Antimicrobial agents**
- **Drugs acting on the autonomic nervous system**
- **Drugs acting on the respiratory system**

And to understand:

- **Drug development in a clinical research organization setting**

In going through the problems, it is important that **you constantly refer to the above items** to ensure that you are in fact acquiring those that are relevant for the overall goals of the program. **The above list is a MINIMAL one and clearly all of you will learn much, much more. DO remember that you are not taking this course to pass an exam and get a grade but to prepare for the long term.** There will be ample opportunity to revise and recapitulate information since redundancy and repetition are crucial for proper learning. We believe firmly that it is better to know selected items well rather than a large number of items poorly.

In addition, the problems are designed to reinforce prior knowledge in physiology, biochemistry and statistics. The last is particularly important as pharmacology being an experimental science relies heavily on statistics. However, the kind of statistics that you will need may be slightly different from what you have studied earlier. Thus there will be an emphasis on small sample statistics and both parametric and non-parametric tests. **It is our cherished belief that knowledge cannot be compartmentalized, that what you learn in this course can be applied elsewhere and things you have learned in other courses have a bearing on this one.** This course is designed to be a companion course to [3B06](#) and much of what you learn here will be useful in your lab course and vice versa.

You would demonstrate that you have acquired these items of information by:

(a) Participation:

Active, involved ongoing participation in the tutorials which will be evaluated at the end of EACH tutorial session using the forms prescribed. Active participation demands that the student be responsible, bring in new information, communicate that information effectively, critically evaluate the information that he/she brings as well as that provided by others, and finally be able to assess their own performance appropriately. We believe strongly that continual evaluation (formative) is far more crucial than periodic tests. Hence our emphasis on this component. Details are provided in the section of this outline beginning on page 5. **Please read carefully.** The form that you will need is given on the last page of this document; extras can be downloaded from the [Program's website](#).

(b) Problem Summaries:

These will be submitted to the tutor at the end of each problem discussed. To keep it simple, we suggest you follow a specific format.

(i) Problem discussed: Names (student/tutor).

(ii) A Listing of issues generated/Learning Tasks defined and the course objectives that were met.

(iii) A brief summary describing your understanding of the pharmacological principles that formed the core of the problem. This must be phrased in your own words. This is for your benefit. The information will be a document of your learning and will also help you improve your writing skills. Acknowledge sources that you used.

(c) Successful completion of a TRIPSE - Tri-Partite Problem-Solving Exercise:

This is a three-part formal examination that we will be scheduled during the examination period at the end of the second term. It is an exercise that attempts to simulate the scientific process. You will be presented with a hypothetical experimental situation that poses a pharmacological problem. In the first part, you will be asked to provide hypotheses or explanations for the observations made. In the second part you will choose one of your explanations and design experiments to test its validity. Finally, you will be given further information and asked to re-evaluate your answers to the previous sections in light of the new knowledge. You will be evaluated on your ability to frame suitable hypotheses, devise experiments, and reassess the hypotheses. In the first term you will have the opportunity to work on previous TRIPSEs, in a group setting, so that you can become familiar with the process.

In most cases there are no uniquely correct answers, but sets of plausible ones that vary in their sophistication and plausibility. To be successful in the TRIPSE you will have to use principles you have learned, but precise topics will be in areas not included in the course content, so cramming of facts will not be helpful.

(d) Critical analysis of a published paper:

The objectives of this exercise are to help you acquire the skills required to read published papers critically. More information is available from the [program's website](#). The published paper will be assigned at the end of **October**.

(e) Submission of a Clinical Trial Proposal:

This is a student-centered exercise that will test your ability to understand aspects of pharmacology completely on your own. You will be required to demonstrate that you have grasped the essential principles of the design of phase 3 clinical trials by incorporating them into a proposal for the clinical trial of a drug. You can also use this as an opportunity to explore any area of pharmacology or therapeutics that is of special interest to you because the choice of the condition or disease to be treated is entirely yours. You can invent the drug to test or use an existing drug in a novel application. The assessment will be based on a clear statement of objectives, logical development of the proposal, adherence to the general principles of clinical trial design, appropriate referencing, and imagination. You may work in groups of up to three students for this project. Information can be obtained from a variety of sources (journals, reviews, texts). Rather than prescribe a single text, we wish you to decide what is appropriate. Tutors would be happy to help you out in case you need it.

We will provide you with a very brief outline of the essential points to cover in a joint tutorial session tentatively scheduled for **February 2023**. Thereafter, you are on your own. **The submission date for this exercise will be in March, 2024** and will be organized by Dr. Renee Labiris.

The marks will be allocated as shown:

<b><u>Term 1 (50 marks)</u></b>			
Class Participation	20	}	50
Problem Summaries	10		
Critical Analysis of a Published Paper*	10		
Mid-Term TRIPSE*	10		
<b><u>Term 2 (50 marks)</u></b>			
Class Participation	20	}	50
Problem Summaries	5		
Clinical Trial Proposal**	15		
End-Term TRIPSE*	10		

\*These sections will be organized by Dr. Jan Huizinga

\*\*This section will be organized by Dr. Renee Labiris

## Academic Dishonesty

Academic dishonesty consists of misrepresentation by deception or by other fraudulent means and 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. It is your responsibility to understand what constitutes academic dishonesty. For information on the various kinds of academic dishonesty please refer to the Academic Integrity Policy located at <http://www.mcmaster.ca/policy/Students-AcademicStudies/AcademicIntegrity.pdf>, specifically Appendix 3.

The following illustrates only three forms of academic dishonesty:

1. Plagiarism, e.g. the submission of work that is not one's own or for which other credit has been obtained.
2. Improper collaboration in group work.
3. Copying or using unauthorized aids in tests and examinations.

In this course we will randomly use a software package designed to reveal plagiarism. Students will be required to submit some of their work electronically and in hard copy so that it can be checked for academic dishonesty.

### **Evaluation in a Problem-Based Program by P.K. Rangachari, modified by D.J. Crankshaw**

Educational enterprises hope to produce changes in knowledge, skills or attitudes, preferably all three. Such changes are best realised if students are actively involved in their own learning. Problem-based Learning, particularly the small-group tutorial variety hopes to create an environment in which such change becomes the norm rather than the exception. The ultimate aim of such enterprises is to produce the truly autonomous, responsible student. Such hopes will, however, remain unfulfilled if we are unable to set in place procedures that help us determine whether such aims have been realised. Thus evaluation is essential.

Evaluation is customarily divided into broad categories: FORMATIVE and SUMMATIVE. Formative evaluation is periodic on-going evaluation that helps the student form or develop. For problem-based courses that attempt to produce autonomous self-directed learners this component is crucial. Summative evaluation attempts to gauge the students' performance at the end of a specific period, either at the middle of a term, end of a term or the end of a course. To add to the complexities, problem-based courses stress the inextricable linkage between process and content. This means that WHAT a student has learned is significantly related to HOW it was learned. It is thus necessary to evaluate both process and content.

In all the courses that comprise this Program, several different evaluation procedures are used. We believe that this is essentially fairer to students, giving them an opportunity to demonstrate their strengths in at least one, preferably more, procedures. Amongst the procedures used are tutorial evaluations using prescribed forms, problem summaries, essays on specific topics and a process-oriented problem solving exercise called a TRIPSE (Tri-Partite Problem-Solving Exercise). The relative weights allotted to each component vary with each course. As tutorials form the basis of all courses in this program, we will discuss some of the features of tutorial evaluation in the section that follows.

Evaluation of tutorial performance is fraught with difficulties. Responsible evaluation, particularly of tutorial performance, demands that individuals recognize their own fallibility, accept their own weaknesses and honestly do the best they can.

To ease this process, we have developed several categories under which tutorial performance can be evaluated. These were initially suggested by the first group of students that entered this program and we thus have instituted the notion of responsible students from the very outset. These categories are as follows:

- **Responsibility**
- **Information gathering**
- **Communication**
- **Critical sense**
- **Self-assessment**

There are two parties to the tutorial process, the students and the tutors. Although the same categories can be applied to both, the expectations are different. These are described in the accompanying pages, where we contrast the expectations we have for outstanding and poor performances. This should give you some flavour of the range of behaviours possible.

In our courses, formative evaluation will be held at the end of **each** tutorial. Using the descriptors provided on the attached [Formative Evaluation](#) form you will characterise your performance on **each** category on **that** day. This is your assessment. You will rate your performance (except **self-assessment**) based on your performance and the descriptors provided, and explain your reasons for doing so. Following this the other students as well as the tutor will give their comments. If the group agrees essentially with the comments you have made, you can give yourself a high score for your ability to evaluate yourself accurately that day. The tutors take an active role in this process because they have had extensive experience with

this format and are able to gauge individual performances in a broader perspective. This process requires practice and is not easy. However as the term progresses, you will be able to gauge your performance with confidence.

At the end of each term, a different sort of evaluation will occur. This is called **SUMMATIVE** evaluation. This implies that it is the assessment of your performance over the period of assessment. **The factors that will be taken into account are consistency of performance, improvement and growth.** MOST, if not all, students are capable of performing at an excellent to outstanding level some of the time; **very few** do it all the time. **Consistency** of performance will be an important criterion in deciding the mark to be given. Other factors to be considered will be growth, development during the course of the term (the **delta** factor). The mark that is finally given is decided **not by the student but by the tutor who will take into consideration all points of view.** The reasons for this are simple - with their experience the tutors are better able to temper the remarks made by the students, and it is the **tutor's responsibility to the University** to allot the grade. If ongoing formative evaluation has been appropriate and rigorous, the comments made during this mid-unit phase and the grades allotted will come as no surprise. The tutor will allot a numerical score to make subsequent calculations easier.

### ***The Student in the Program:***

From the outset we have made it clear that we are interested in teaching students who are willing to accept responsibility for their own learning to a substantial degree. Since this is a Co-op Program, the behaviours you exhibit within the academic setting have considerable bearing on your performance in the work terms, whether in academia, industry or in other institutional settings. The categories that we have listed and describe emphasize our position.

### ***The Tutor in the Program:***

Tutors play a significant role in this program. **Tutors are NOT TAs.** They are members of the Faculty. They are thus older (perhaps wiser) and bring to the tutorial considerable experience not only in tutoring but also in pharmacology. They are teachers in the truest sense of the word. They treat students with respect and affection, and create an exciting environment in which students can develop and express their innate qualities. Although the tutors in this program have a basic interest in the discipline of pharmacology, obviously they are not experts in all aspects of the field, but they do have special interest and knowledge in the specific course they are involved in. The behaviours described in the list give you a flavour of the range possible. Remember that the tutor has a responsibility to you as well as the Program.

"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 either type of 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."

## PROFILE OF A STUDENT

CATEGORIES	OUTSTANDING (A+)	POOR (D)
	<i>consistently:</i>	
<b><i>Responsibility</i></b>	<ul style="list-style-type: none"> <li>• completes assigned tasks</li> <li>• participates actively</li> <li>• listens to others</li> <li>• adds information where appropriate</li> <li>• encourages participation of others</li> <li>• does not impede tutorial process by interrupting</li> <li>• facilitates learning of others</li> </ul>	<ul style="list-style-type: none"> <li>• fails to complete assigned tasks</li> <li>• participates marginally in tutorials</li> <li>• does not listen</li> <li>• confuses others with inappropriate comments</li> <li>• does not encourage participation of others</li> <li>• impedes tutorial process by interrupting</li> <li>• does not facilitate the learning of others</li> </ul>
<b><i>Information</i></b>	<ul style="list-style-type: none"> <li>• brings in information which is new, relevant, and complements that brought by others</li> <li>• uses a variety of sources (texts, journals, reviews)</li> </ul>	<ul style="list-style-type: none"> <li>• brings in no new information or provides irrelevant information</li> <li>• uses very few sources of information</li> </ul>
<b><i>Communication</i></b>	<ul style="list-style-type: none"> <li>• communicates ideas clearly/concisely</li> <li>• ensures that others are not confused by information presented</li> </ul>	<ul style="list-style-type: none"> <li>• rambles on or is inaudible</li> <li>• confuses others</li> </ul>
<b><i>Critical Sense</i></b>	<ul style="list-style-type: none"> <li>• justifies comments with appropriate references</li> <li>• promotes a deeper understanding of the subject</li> <li>• challenges information brought, permitting others to evaluate relevance / significance of their comments</li> </ul>	<ul style="list-style-type: none"> <li>• fails to justify comments made</li> <li>• fails to promote a deeper understanding of the subject</li> <li>• fails to question/challenge others and thus does not permit them to assess relevance / significance of their comments</li> </ul>
<b><i>Self-assessment</i></b>	<ul style="list-style-type: none"> <li>• recognises strengths and weaknesses</li> <li>• accepts criticism gracefully</li> <li>• identifies means to correct weaknesses</li> <li>• demonstrates effective action to correct weaknesses</li> </ul>	<ul style="list-style-type: none"> <li>• fails to recognise personal strengths and weaknesses</li> <li>• fails to accept constructive criticism gracefully</li> <li>• becomes defensive and argumentative and does not identify means to correct weaknesses</li> <li>• fails to demonstrate effective action to correct weaknesses</li> </ul>

## PROFILE OF A TUTOR

CATEGORIES	OUTSTANDING	POOR
<b><i>Responsibility</i></b>	<p><i>consistently:</i></p> <ul style="list-style-type: none"> <li>• treats students with respect and affection</li> <li>• ensures that individual members are given an opportunity to participate</li> <li>• ensures that students recognise each other's contribution</li> <li>• provides clear consistent constructive feedback</li> <li>• creates an atmosphere of excitement and enjoyment</li> <li>• is available to discuss matters of individual concern</li> <li>• is able to counsel students about the depth / breadth of their coverage of specific issues</li> <li>• assists students in setting learning tasks that are appropriate for the objectives of course, achievable in the time available, and sufficiently challenging</li> <li>• ensures that all students fully understand the learning tasks</li> </ul>	<ul style="list-style-type: none"> <li>• shows no respect or affection for students</li> <li>• does not ensure that individual members are given an opportunity to participate</li> <li>• does not ensure that students recognise each other's contribution</li> <li>• does not provide clear consistent constructive feedback</li> <li>• fails to create an atmosphere of excitement and enjoyment</li> <li>• is unavailable to students for individual attention</li> <li>• is unable to provide adequate counsel</li> <li>• takes no part in setting learning tasks</li> <li>• allows students to leave tutorial without a clear understanding of the learning tasks</li> </ul>
<b><i>Information</i></b>	<ul style="list-style-type: none"> <li>• provides information when appropriate</li> <li>• does not INFLICT information</li> <li>• complements information brought by students</li> <li>• permits students to acquire a deeper appreciation of the subject by bringing in a historical/reflective perspective</li> </ul>	<ul style="list-style-type: none"> <li>• does not provide information when appropriate</li> <li>• inflicts information</li> <li>• remains silent and fails to complement information brought by students</li> <li>• fails to provide a perspective</li> </ul>
<b><i>Communication</i></b>	<ul style="list-style-type: none"> <li>• is clear and concise</li> <li>• ensures that comments are not confusing</li> </ul>	<ul style="list-style-type: none"> <li>• is rambling and verbose</li> <li>• is confusing</li> </ul>
<b><i>Critical Sense</i></b>	<ul style="list-style-type: none"> <li>• ensures that misinformation/erroneous concepts are challenged and corrected</li> <li>• insists that students provide adequate references</li> <li>• creates an atmosphere where information/concepts can be adequately criticised and challenged</li> </ul>	<ul style="list-style-type: none"> <li>• fails to correct misinformation/allows erroneous concepts to persist</li> <li>• allows students to present information without adequate references</li> <li>• does not create an atmosphere where information/concepts can be adequately criticised and challenged</li> </ul>
<b><i>Self-assessment</i></b>	<ul style="list-style-type: none"> <li>• recognises strengths and weaknesses</li> <li>• accepts criticism with grace</li> </ul>	<ul style="list-style-type: none"> <li>• does not recognise own strengths and weaknesses</li> <li>• fails to accept criticism gracefully</li> </ul>



FORMATIVE EVALUATION: [McMaster University Honours Biology & Pharmacology Program](#)

Course: \_\_\_\_\_

Term: \_\_\_\_\_

Student: \_\_\_\_\_

WEEK NUMBER	DATE	RESPONSIBILITY	INFORMATION	COMMUNICATION	CRITICAL SENSE	SELF-ASSESSMENT
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						

You may or may not need this form for the first weeks if assigned by your tutor. This evaluation is intended to help you assess and keep track of your own progress.