Faculty of Medicine
School of Medical Sciences

PHAR3306

PHARMACOLOGY for OPTOMETRY

COURSE OUTLINE

TERM 2, 2019

CRICOS Provider Code 00098G

TABLE OF CONTENTS

Please read this manual/outline in conjunction with the following pages on the School of Medical Sciences website:

- Advice for Students
- Learning Resources

(or see "STUDENTS" tab at medicalsciences.med.unsw.edu.au)

PHAR3306 Course Information

UNIT OF CREDIT (UOC)

Pharmacology for Optometry is a 3rd year Science Course with 6 Units of Credit (UOC). This course builds on the knowledge you have gained in VISN2111 Ocular Anatomy and Physiology, PHSL2101 Physiology 1A, PHSL2201 Physiology 1B, VISN2231 Introduction to Ocular Disease.

OBJECTIVES OF THE COURSE

The aim of the course is to provide optometry students with a strong knowledge base in pharmacology and therapeutics that will benefit them in their future optometric practice. This is achieved by providing the essential knowledge of the mechanisms of action of pharmacological agents and their therapeutic use in the treatment of systemic and ocular diseases, with emphasis on the agents that optometrists are licensed to prescribe. Topics covered include basic principles of drug action, pharmacokinetics, pharmacodynamics, autonomic pharmacology, major drugs used in the management of cardiovascular, central nervous system, endocrine and inflammatory disorders and infection, as well as drugs for eye diseases.

COURSE LEARNING OUTCOMES

The aims of the course are to:

1. Have developed an understanding of the concepts of pharmacology
2. Be able to apply pharmacological approaches to problem solving
3. Be able to identify areas in the knowledge of pharmacology that could be improved, and carry out the research necessary to “fill the gaps”
4. Be able to organise scientific information into a clear report
5. Be able to demonstrate ability to work in teams and communicate scientific information effectively

GRADUATE ATTRIBUTES

Students will be encouraged to develop the following UNSW Graduate Attributes by undertaking the learning activities and knowledge content. These attributes will be assessed within the prescribed assessment tasks. The full list of UNSW Graduate Attributes is available at https://teaching.unsw.edu.au/graduate-capabilities.

The UNSW Graduate Attributes targeted in this course are:

1. Able to apply their knowledge and skills to solving problems
2. Rigorous in their analysis, critique, and reflection
3. Capable of independent, self-directed practice
4. Understanding of their discipline in its interdisciplinary context
5. Ethical practitioners

COURSE CO-ORDINATOR AND LECTURERS

Course Coordinator:
Dr Johnson Liu
Rm 323 Wallace Wurth Building; Ph: 9385 9086; Email: johnson.liu@unsw.edu.au

Course Co-Coordinator:
Dr Natasha Kumar
Rm 329 Wallace Wurth Building; Email: natasha.kumar@unsw.edu.au

Students wishing to see the course coordinators should make an appointment *via* email as our offices are not readily accessible. We will organize to meet you in a convenient location elsewhere in the building.

Lecturers in this course:

Dr T. Binder	w.binder@unsw.edu.au
Dr J. Cederholm	j.cederholm@unsw.edu.au
A. Delmadoros	a.delmadoros@unsw.edu.au
Prof N. Di Girolamo	n.digirolamo@unsw.edu.au
Dr R. Grant	r.grant@unsw.edu.au
Dr N. Kumar	natasha.kumar@unsw.edu.au
Dr J. Liu	johnson.liu@unsw.edu.au
Dr M. Markoulli	m.markoulli@unsw.edu.au
Prof M. Morris	m.morris@unsw.edu.au

COURSE STRUCTURE AND TEACHING STRATEGIES

Learning activities occur on the following days and times:

- Lectures: Monday 2-3 pm, Wednesday 4-5 pm and Wednesday 5-6 pm. Webster Theatre A. Weeks 1 to 10, only Monday in Week 11.
- Tutorials: Friday 2-3 pm (Group A) or 3-4 pm (Group B) or 4-5 pm (Group C), in Weeks 1-10 at Morven Brown G4. Once enrolled in one of the three sessions, students cannot change.
- Practicals: Thursday 3-6 pm for both Group 1 and Group 2. Group 1 in Wallace Wurth WW G16/G17 for Weeks 1, 3, 7 and 9, or in WW116 for Week 5; Group 2 in Wallace Wurth WW G16/G17 for Weeks 2, 4, 8 and 10, or in WW116 for Week 6. Once enrolled in one of two groups, students cannot change.
- Mid-session exam: Week 6 (covers Week 1-5); Wednesday 10th July 2019, 4-6 pm, Webster Theatre A.

Students are expected to attend all scheduled activities for their full duration (3 hours of lectures per week and up to 4 hours of practical and collaborative learning sessions per week). Students are reminded that UNSW recommends that a 6 units-of-credit course should involve about 150 hours of study and learning activities. The formal learning activities are approximately 60 hours throughout the term and students are expected (and strongly recommended) to do at least the same number of hours of additional study.

Lectures will provide you with the concepts and theory essential for an understanding of Pharmacology for Optometry. To assist in the development of research and analytical skills practical classes and collaborative learning sessions will be held. These classes allow students to engage in a more interactive form of learning than is possible in the lectures. The skills you will learn in practical classes are relevant to your development as professional scientists.

APPROACH TO LEARNING AND TEACHING

The learning and teaching philosophy underpinning this course is centred on student learning and aims to create an environment which interests and challenges students. The teaching is designed to be engaging and relevant in order to prepare students for future careers.

Although the primary source of information for this course is the lecture material, effective learning can be enhanced through self-directed use of other resources such as textbooks and Web based sources. Your practical classes will be directly related to the lectures and it is essential to prepare for practical classes before attendance. It is up to you to ensure you perform well in each part of the course; preparing for classes; completing assignments; studying for exams and seeking assistance to clarify your understanding.

TEXTBOOKS AND OTHER RESOURCES

These resources will take the form of text books, journal articles or web-based resources. If available, links to the electronic form of these resources will be put on the course Moodle page.

Prescribed textbook:

- Rang HP & Dale MM. Rang and Dale's Pharmacology. 8th Ed. 2016. Churchill Livingstone, Elsevier. (Full eBook available via UNSW Library)
- Bartlett JD & Jannus SD. Clinical Ocular Pharmacology. 5th Ed. 2008 Oxford: Butterworth-Heinemann (Full eBook available via UNSW Library)

Recommended textbooks:

- Goodman and Gilman's The Pharmacological Basis of Therapeutics. 12th ed. McGraw-Hill Companies. (Full e-book available via UNSW Library).
- Velpandian T. Pharmacology of Ocular Therapeutics. 2016. Springer. (eBook available via UNSW Library)

Copies of these textbooks are available in hardcopy and as e-books in the library. See also https://medicalsciences.med.unsw.edu.au/students/undergraduate/learning-resources

National Prescribing Service (NPS) is a member-based organisation providing accurate, balanced, evidence-based information and services to health professionals and the community on Quality Use of Medicines (QUM). You are strongly encouraged to use this service: http://www.nps.org.au/

ASSESSMENT PROCEDURES

- Midsession Exam (2 hours duration) **30%**
- Practical reports (2-short reports, 5% each) **10%**
- Group assignment **10%**
- End of session examination (2 hours duration) **50%**

A penalty will apply for late submissions of assessment tasks (10% per day).

Midsession examination

The *midsession examination* will be held in the lecture slots on Wednesday the 10th of July at 4pm to 6pm at Webster Theatre A. This exam will give you feedback on how you are succeeding in the course. The end of session examination will be held during the official

examination period. The exam questions will mainly be based on the material covered in the lectures; however, material covered in the tutorials and practical classes will also be examinable.

The mid and end of session examinations will address the course learning outcomes 1 and 2 and give you feedback on how you are succeeding in the course.

Practicals and tutorials

The practicals and tutorials are provided to support lecture material and practise analytical skills. The practical classes and tutorials help you to achieve the course learning outcomes. During the practical course, students will be required to submit written reports for two of the practical sessions. The instructions and due date for the lab reports are available on Moodle site. Reports must be as concise as possible. An electronic version of the report must be submitted via Moodle. There will be a "10% mark deduction per day penalty" for late submission. The practical reports will address the learning outcomes 1, 2, 3 and 4.

Group Assignment

You will work in teams to research new approaches/developments in ocular pharmacology and a written report to summarise your findings is required. This assessment task will allow you to develop your research, information literacy, communication and time management skills, as well as allowing you to demonstrate the ability to work in a team and collaborate successfully (Course Learning Outcomes 1, 2, and 5). The electronic version of the assignment must be submitted **via Moodle through Turnitin**, **before 10am, Monday, 29th July**. There will be a "10% mark deduction per day penalty" for late submission. The topics, instructions, and marking criteria for the group assignment can be found on Moodle.

COURSE EVALUATION AND DEVELOPMENT

Each year feedback is sought from students about the course and continual improvements are made based on this feedback. The myExperience online survey is the way in which student feedback is evaluated and is the vehicle by which significant changes to the course will be communicated to subsequent cohorts of students.

GENERAL INFORMATION

The Department of Pharmacology is part of the School of Medical Sciences and is within the Faculty of Medicine. It is located in the Wallace Wurth building. General inquiries can be made through a student portal (http://unsw.to/webforms).

Professor Margaret Morris is Head of Department and appointments to meet with her may be made via email (m.morris@unsw.edu.au).

Postgraduate degrees
The Department of Pharmacology offers students the opportunity to enter into the following graduate programs:

Course Work Masters: Master of Pharmaceutical Medicine. For more information contact Dr Orin Chisholm (o.chisholm@unsw.edu.au)

Research Masters: In Pharmacology. For more information contact the post-graduate co-ordinators Dr Pascal Carrive (p.carrive@unsw.edu.au) and Dr Nicole Jones (n.jones@unsw.edu.au)

Doctorate (***Ph.D)***: In Pharmacology. For more information contact the post-graduate co-ordinators Dr Pascal Carrive (p.carrive@unsw.edu.au) and Dr Nicole Jones (n.jones@unsw.edu.au).

Enrolment and administrative help

The Education Support Team are available to help with problems with enrolment and scheduling and should be the first point of contact for administrative problems. For enrolment issues please contact SOMS student administrators through a student portal (http://unsw.to/webforms).

Official Communication

All communicate will be via your official UNSW email please see Advice for Student-Official Communication for more details.

Attendance Requirements

For details on the Policy on Class Attendance and Absence see Advice for Students and the Policy on Class Attendance and Absence.

Practical Classes

The practical class is an opportunity for students to develop graduate attribute 5 by behaving in an ethical, socially responsible and professional manner within the practical class.

The pre-lab module for each practical class must be completed at least 1 hour prior to attending each practical class. All pre-lab module questions must be completed before you will be allowed entry into the practical class. Students who do not successfully complete the module will need to do the pre-lab module in class prior to starting the experiment. This policy will be strictly enforced. At the start of each class a member of staff will check that the pre-lab is completed and record your attendance in the class roll.

The pre-lab module will inform you of any hazards in the class and safety procedures to follow to mitigate these hazards. Students must take due care with biological and hazardous material and make sure all equipment is left clean and functional. In the interests of safety, special attention should be paid to any precautionary measures recommended in the notes. If any accidents or incidents occur, they should be reported immediately to the demonstrator in charge of the class who will record the incident and recommend what further action is required.

For more details see Advice for Students-Practical Classes

Handwriting

Please see Student Advice-handwriting.

Special Consideration

Please see UNSW-Special Consideration and Student Advice-Special Consideration

If you unavoidably miss the progress exam in PHAR3306, you must lodge an online application via myUNSW for special consideration. If your request for consideration is granted an alternative assessment will be organised which may take the form of a supplementary exam or increased weighting of the final exam. Students are required to make an on-line Special Consideration for **ALL** assessment tasks – this is a change on previous regulations.

Student Support Services

Details of the available student support services can be found at Student Advice-Student support services.

Appeal Procedures

Details can be found at Student-Advice-Reviews and Appeals

Academic Integrity and Plagiarism

The UNSW Student Code outlines the standard of conduct expected of students with respect to their academic integrity and plagiarism.
More details of what constitutes plagiarism can be found here

LECTURE OUTLINES

Pharmacodynamics - Sites of drug action

This lecture provides an introduction to pharmacodynamics (what the drug does to the body). Topics include; receptors, affinity and efficacy, side effects, desensitisation, up and down regulation, quantitation of drug-receptor interactions, dose-response curves, ED_{50}, and spare receptors.

Pharmacodynamics - Agonist and antagonist activity

Competitive antagonism, irreversible antagonism, functional (physiological) antagonism, chemical antagonism, concept of tone, potentiation, partial agonists, quantitative response, quantal response, therapeutic ratio, indirectly acting drugs.

Pharmacokinetics - Drug absorption and distribution

Pharmacokinetic parameters, half-life, volume of distribution and clearance. Relationship between lipid solubility and drug absorption, distribution, excretion, drug dosage forms, advantages and disadvantages. Renal filtration, reabsorption and secretion. Renal dysfunction and elimination.

Pharmacokinetics - Drug metabolism

Pathways of metabolism of drugs including phase I and phase II metabolism. Hepatic and extrarenal metabolism, genetic polymorphisms and their effects on duration of drug action. Important pathways of ocular drug metabolism. Pharmacokinetic formulae and calculations.

Pharmacokinetic formulae and calculation

This lecture will introduce the definition of key pharmacokinetic parameters including clearance (CL), bioavailability (F), half-life, volume of distribution (Vd), steady state concentration (Css), loading dose (DL), how to use the pharmacokinetic formulae to calculate these pharmacokinetic parameters, and key features of a one-compartment pharmacokinetic tools.

Introduction to autonomic pharmacology

Introduction to autonomous nervous system (ANS), the mechanism of physical antagonisms mediated by ANS, concepts of neurotransmission including cholinergic transmission and adrenergic transmission, and an overview of ANS receptors (cholinergic receptors and adrenergic receptors).

Drug selectivity: adrenergic receptors

This lecture will cover drug selectivity and on- and off-target adverse effects. The adrenergic receptor family will be used as the example to explore these concepts. We will examine how the nine adrenergic receptor subtypes provide the opportunity to design drugs that are selective for one subtype over the others and the benefits this brings. The mechanism of actions of sub-type selective adrenergic agonists will be covered along with their use and the method of their administration in the treatment of disease.

Modulation of neurotransmitter activity: adrenaline and noradrenaline

Introduction to different ways in which we can manipulate neurotransmitter activity to effectively alleviate disease symptoms. Using the adrenergic system as an example we will explore how the modulation of the storage, release, reuptake, or metabolism of noradrenaline can be achieved. In addition, we will examine the mechanism of actions of sub-type selective adrenergic antagonists and their use and the method of their administration in the treatment of diseases.

Modulation of neurotransmitter activity: acetylcholine and cholinergic receptors

We will again focus on the different ways in which we can manipulate neurotransmitter activity to effectively alleviate disease symptoms. We will apply the concepts we have learnt in the previous two lectures to the cholinergic system and the modulation of the actions of acetylcholine.

Autonomic control of the eye and autonomic ocular drugs

Introduction to cholinergic synapse, adrenergic synapse and ANS innervating in the eye, especially ANS control of pupillary function and focus of lens, and the mechanism of action, clinical use, side effects and contraindications of common autonomic drugs in optometry, including cycloplegics, miotics, mydriatics, which are classified as parasympathomimetics (carbachol and pilocarpine), parasympatholytics (atropine, tropicamide and cyclopentolate), sympathomimetics (phenylephrine and dipivefrine) and sympatholytics (brimonidine and timolol).

Opioids in pain management and the eye

Introduction to the history and development of opioids, the opioid receptors and the chemistry of the opioids, including naturally occurring, semisynthetic and synthetic opioid, clinical pharmacology of commonly used agents, including morphine, codeine, pethidine, methadone, dextropropoxyphene, fentanyl, oxycodone, naloxone, buprenorphine, and their relevance to optometry.

Prostaglandins and Carbonic Anhydrase Inhibitors

Introduction to prostaglandin synthesis and their receptor locations, the mode of action and the role of prostaglandin analogues and carbonic anhydrase inhibitors in aqueous humour production and outflow within the eye, and the biological functions, therapeutic use, adverse effects and contraindications of there agents.

CNS drugs: antidepressants, sedatives/hypnotics

Monoamine theory of depression; pharmacology of antidepressant drugs. Tricyclic antidepressants, possible modes of action, side effects, overdose. MAO inhibitors: side effects including food interactions (hypertensive crisis) of non-specific MAO inhibitors. Specific MAO inhibitors (moclobemide). SSRI's (fluoxetine as prototype). Desirable properties of sedatives and hypnotics. Mechanism of action of benzodiazepines and barbiturates.

Pharmacology of benzodiazepines. Advantages of benzodiazepines over barbiturates. Zopiclone, a new hypnosedative. Indications for use.

Psychotropic drugs and the eye

Introduction to different types of epilepsy and anticonvulsant drugs: clonazepam, valproate, vigabatrin, phenobarbitone, primidone, phenytoin, carbamazepine, ethosuximide, trimethadione, their mechanism of action and adverse effects on CNS, blood and other tissues. Introduction to sedatives and hypnotics, and their desirable properties, mechanism of action and clinical indications of benzodiazepines, barbiturates and zopiclone, a new hypnosedative.

Antiglaucoma drugs

Brief introduction to the pathology of glaucoma and ocular hypertension. Rationale for the use of directly acting cholinomimetics, acetylcholine esterase inhibitors, adrenergic ligands and carbonic anhydride inhibitors in treatment of glaucoma. Comparison of pharmacokinetics, routes of administration, contraindications and side effects of these drug classes.

General and local anaesthetics

Introduction to definition of general and local anaesthesia, structure activity relationships, mode of action and metabolism of commonly used agents, and their therapeutic applications and toxicity.

VEGF and angiogenesis in eye disease

Vascular endothelial growth factor A (VEGF-A) is a central mediator in blood vessel growth (angiogenesis) in the eye. “Wet AMD” is a particular form of age-related macular degeneration caused by abnormal growth of blood vessels under the macula. Currently available antiangiogenesis drugs for the treatment of wet AMD will be presented.

Introduction to cardiovascular pharmacology

Introduction to cardiovascular pharmacology, cardiovascular diseases and drugs, including major classes of antihypertensive drugs - ACE inhibitors, calcium antagonists, diuretics, beta-blockers, alpha blockers; commonly used examples from each class; review of basic pharmacology/mechanisms of action; adverse effects and contraindications Actions, interactions and side effects of the diuretics will be covered, and their clinical uses

Cardiovascular diseases and the eye

Introduction to the interrelation between major cardiovascular diseases and the eye, the features of vasculature of the eye and heart, common risk factors, their impact on the normal functions of the eye, such as the influence of systemic hypertension on the IOP and age-related macular degeneration.

Drugs to treat thrombosis

Review of the mechanism of thrombosis formation. The mechanism of actions of (i) anti-platelet drugs, (ii) anti-coagulation drugs and (iii) thrombolytic drugs. By the end of the lecture students should be able to (i) describe how aspirin prevents platelet activation; (ii) identify drugs which prevent thrombosis formation versus drugs which remove thrombosis (iii) describe the mechanisms of action of warfarin and heparin.

Endocrine drugs- antidiabetic drugs

Improving glycaemic control using orally active agents, incorporating mechanism of action, clinical use, side effects of the following drugs: sulphonylureas; metformin, tolbutamide, chlorpropamide, glibenclamide. Insulin sensitising agents.

Endocrine drugs- thyroid drugs

Drugs used to treat deficiencies or overactivity in thyroid secretion: thyroxine, triiodothyronine, propylthiouracil, carbimazole, radioactive iodine, high dose iodine, ß blockers.

Treatment of inflammation of the eye

An overview of the inflammation of the eye and its treatment, including different causes, such as bacteria, viruses or fungi; different parts that are infected such as uveitis, conjunctivitis, keratitis and episcleritis; common symptoms and treatments, including corticosteroids, NSAIDs, different routes of administration, topical ocular use, local injection, intravitreal and systemic treatment.

Anti-inflammatory drugs-NSAIDs

Gross effects, therapeutic uses (including ocular) and side effects of non-steroidal anti-inflammatory drugs. Relationships of effects of NSAIDs to inhibition of cyclooxygenase, analgesia, anti-inflammatory, antipyresis, anti-platelet effects, effects on uterus, gastrointestinal tract. Selective COX-2 inhibitors.

Anti-inflammatory drugs-steroids

Inappropriate inflammatory or immune reactions are involved in many disease processes. Anti-inflammatory drugs have been either glucocorticosteroids (GCS), or non-steroidal agents (NSAIDs). The pathway of synthesis of the prostaglandins and their major actions. The gross effects (including the anti-inflammatory effects) of the GCS. Dose forms of eye drops and ointments. Additives to eye drops of GCS.

Antihistamine and mast cell stabilizers

History. Synthesis & storage. Histamine release. Metabolism. Effects of histamine with focus on allergic reaction and gastric acid secretion. The “triple response”. Histamine H_1 and H_2 receptors. Anti-histamines: actions & clinical uses. Commonly used mast cell stabilizers and how mast cell stabilizers work to prevent or control allergic disorders.

Antibiotics

Mechanisms of action of antibiotics and antimicrobial agents, including inhibitors of DNA synthesis (inhibitors of DNA gyrase and folic acid biochemistry), cell wall synthesis (inhibitors of peptido-glycan synthesis), and the various steps in protein synthesis.

Antiviral and antifungal agents

Pathogenic viruses, viral life cycles, virus-specific targets, DNA polymerase inhibitors, reverse transcriptase inhibitors, protease inhibitors, inhibitors of virus attachment. Pathogenic fungi, sites for chemotherapeutic intervention, antifungal antibiotics including amphoteracin and nystatin, antifungal drugs including flucytosine, azoles such as ketoconazole and clotrimazole.

Ocular surface diseases

This lecture covers common benign (pterygium) and rare malignant (ocular surface squamous neoplasia) disease that arise on the ocular surface. An outline of the basic biology of the cornea is given and how its stem cells help maintain health and transparency. The main

questions put forth is “What factors trigger ocular surface tumours”? Evidence to answer this question is drawn from the literature as well as from the lecturer’s own research program.

Dry eyes and treatment

The tear film, functions of the tear film and tear secretion; causes and pathophysiology of dry eye; management and pharmacological treatment of dry eye.

Ocular and systemic adverse drug effects

Epidemiology, severity, most common drugs; type A reactions, dose dependent, related to usual actions of drug; type B reactions, not dose dependent, not related to usual actions of drug. Adverse ocular and systemic effects of drugs administered in eye drops. Adverse ocular effects of drugs administered orally or by injection.

APPENDIX I. THE USE OF OCULAR THERAPEUTIC DRUGS IN AUSTRALIA[1]

Fact sheet

22 March 2013

Guidelines for use of scheduled medicines

The Optometry Board of Australia (the Board) has approved a revised version of its *Guidelines for use of scheduled medicines* (the Guidelines). The Guidelines are published under the *Policies, Codes and Guidelines* tab of the Board's website.

The amended Guidelines aim to increase quality care choices for patients living with chronic glaucoma or who are at high risk of developing the disease, particularly where access to specialist care is an issue.

Summary

The amendments to the Guidelines:

- enable optometrists whose registration is endorsed for scheduled medicines to initiate and implement management (in the form of eye drops) for patients diagnosed with chronic glaucoma, or who are at high risk of developing the disease, and
- support a multi-disciplinary team approach to managing eye conditions, including communication between other healthcare practitioners involved in the patient's care, in particular the general practitioner.

Optometrists whose registration is endorsed for scheduled medicines still have the options to either refer patients with chronic glaucoma to an ophthalmologist for ongoing care or enter into a shared care arrangement – and many optometrists are likely to continue to do so where access to specialist care is not an issue.

Optometrists are already authorised to prescribe topical glaucoma medications

Anti-glaucoma eye drops are currently an integral part of treatment for chronic glaucoma, and optometrists whose registration is endorsed for scheduled medicines are already authorised to prescribe these drugs in all states and territories.

The list of scheduled medicines that optometrists who have completed accredited training are qualified to prescribe is included in the Guidelines and in the Board's *Endorsement for scheduled medicines registration standard*. The standard is published under the *Registration Standard* tab of the Board's website.

[1] from http://www.optometryboard.gov.au/Policies-Codes-Guidelines.aspx

List of Schedule 2, 3 and 4 medicines approved by the Optometry Board of Australia for administration by optometrists holding general registration

Under section 94 of the National Law, the Board may endorse the registration of eligible optometrists as qualified to obtain, possess, administer, prescribe or supply the scheduled medicines used in the treatment of conditions of the eye, included in the list below.

Table C1 lists the Schedule 4 medicines that have been approved for use by optometrists whose registration has been endorsed by the Board. This is a duplicate of the list published in the Board's Endorsement for scheduled medicines registration standard.

For an optometrist to possess, prescribe, supply or use these Schedule 4 medicines in a particular jurisdiction, the authorisation must be provided for by enactment of legislation in that jurisdiction. Registered optometrists should be familiar and comply with the current requirements in the jurisdictions in which they practise. The Board will publish on its website a list of authorities that apply in each state and territory.

Board-approved list of Schedule 2, 3 and 4 medicines that optometrists with a scheduled medicines endorsement are qualified to obtain, possess, administer, prescribe or supply for topical use (reviewed by Johnson Liu 2019)

Schedule 4 Prescription Only Medicine

Anti-infectives	**Anti-inflammatories**	**Decongestants/ anti-allergics**	**Anti-glaucomas**	**Miotics, mydriatics and cycloplegics**	**Local anaesthetics**
Aciclovir Azithromycin Bacitracin Cephazolin Ciprofloxacin Framycetin Gentamicin Gramicidin Neomycin Ofloxacin Polymyxin Tetracycline Tobramycin	Cyclosporin Dexamethasone Diclofenac Fluorometholone Flurbiprofen Hydrocortisone Ketorolac Lotepredol Prednisolone	Olopatadine	Apraclonidine Betaxolol Bimatoprost Brimonidine Brinzolamide Dorzolamide Latanoprost Pilocarpine Tafluprost Timolol Travoprost	Atropine Cyclopentolate Homatropine Pilocarpine Phenylephrine Tropicamide	Amethocaine Lignocaine Oxybuprocaine Proxymetacaine

Schedule 3 Pharmacist Only Medicine

Anti-infectives
Chloramphenicol

Schedule 2 Pharmacy Medicine

Anti-infectives	**Anti-inflammatories**	**Decongestants/ anti-allergics**	**Miotics, mydriatics and cycloplegics**
Dibromopropamidine Propamidine	Antazoline Azelastine Ketotifen Levocabastine	Lodoxamide Naphazoline Pheniramine Sodium Cromoglycate	Phenylephrine <1%

COURSE TIMETABLE

PHAR3306 Pharmacology for Optometry, Timetable 2019 T2

LECTURES						TUTORIALS *		PRACTICAL CLASSES **	Online Activities
Week	**Date**	**Time**	**Theatre**	**Lecture title**	**Lecturer**	**Tut Title**	**Date/Time @ MorvB G4**	**Date/Time/Venue**	
1	**June 3, Mon**	2-3 pm	Webst ThA	Welcome/Pharmacodynamics - Sites of drug action	Liu/Kumar/ Binder	Welcome & Group assignment instructions	**June 7, Fri** 2-3 pm (A) 3-4 pm (B) 4-5 pm (C)	**June 6, Thur, 3-6 pm** Concentration response **Group 1; Wallace Wurth G16/G17**	
	June 5, Wed	4-5 pm	Webst ThA	Pharmacodynamics - Agonist and antagonist activity	T. Binder				
	June 5, Wed	5-6 pm	Webst ThA	Pharmacokinetics - Drug absorption and distribution	R. Grant				
2	**June 10, Mon**	**Public Holiday (Queen's Birthday)**				Pharmacodynamics	**June 14** Online module	**June 13 Thur, 3-6 pm** Concentration response **Group 2; WW G16/G17**	Introduction to Autonomic Pharmacology
	June 12, Wed	4-5 pm	Webst ThA	Pharmacokinetics - Drug metabolism	R. Grant				
	June 12, Wed	5-6 pm	Webst ThA	Pharmacokinetic formulae and calculations	R. Grant				
3	**June 17, Mon**	2-3 pm	Webst ThA	Drug selectivity: adrenergic receptors	J. Cederholm	Ocular pharmacokinetics	**June 21** Online module	**June 20, Thur, 3-6 pm** Pharmacokinetics **Group 1; WW G16/G17**	Opioids in pain management & the eye
	June 19, Wed	4-5 pm	Webst ThA	Modulation of neurotransmitter activity: adrenaline and noradrenaline	J. Cederholm				
	June 19 Wed	5-6 pm	Webst ThA	Modulation of neurotransmitter activity: acetylcholine and cholinergic receptors	J. Cederholm				
4	**June 24, Mon**	2-3 pm	Webst ThA	ANS control of the eye/cycloplegics, miotics, mydriatics	J. Cederholm	Cycloplegics, miotics, mydriatics, anti-glaucoma case studies	**June 28, Fri** 2-3 pm (A) 3-4 pm (B) 4-5 pm (C)	**June 27, Thur, 3-6 pm** Pharmacokinetics **Group 2; WW G16/G17**	CNS-Antidepressants, Sedatives/Hypnotics
	June 26, Wed	4-5 pm	Webst ThA	Prostaglandins and CAIs	J. Liu				
	June 26, Wed	5-6 pm	Webst ThA	Psychotropic drugs and the eye (inc epilepsy)	N. Kumar				
5	**July 1, Mon**	2-3 pm	Webst ThA	Anti-glaucoma drugs	A. Delmadoros	CNS drugs case studies	**July 5, Fri** 2-3 pm (A) 3-4 pm (B) 4-5 pm (C)	**July 4, Thur, 3-6 pm** Human Pharmacology **Group 1; WW 116**	Introduction to cardiovascular pharmacology
	July 3, Wed	4-5 pm	Webst ThA	General and local anaesthetics	N. Kumar				
	July 3, Wed	5-6 pm	Webst ThA	VEGF and angiogenesis in eye disease	J. Liu				
6	**July 8, Mon**	2-3 pm	Webst ThA	Cardiovascular disease and the eye	M. Morris	Formative Quiz	**July 12, Fri**	**July 11, Thur, 3-6 pm**	

	July 10, Wed	4-6 pm	**Mid-Session Exam (covers Week 1-5), Wed July 10, 4-6 pm, Webst ThA**		J.Liu N. Kumar			Online module	Human Pharmacology **Group 2; WW116**	
7	**July 15, Mon**	2-3 pm	Webst ThA	Drugs to treat thrombosis	T. Binder		Cardiovascular & Endocrine case studies	**July 19, Fri** 2-3 pm (A) 3-4 pm (B) 4-5 pm (C)	**July 18, Thur, 3-6 pm** CNS drugs **Group 1; WW G16/G17**	
	July 17, Wed	4-5 pm	Webst ThA	Endocrine drugs - Drugs to treat diabetes	M. Morris					
	July 17, Wed	5-6 pm	Webst ThA	Endocrine drugs - Thyroid drugs	M. Morris					
8	**July 22, Mon**	2-3 pm	Webst ThA	Anti-inflammatory drugs - NSAIDs	T. Binder		Anti-inflammatory case studies	**July 26, Fri** 2-3 pm (A) 3-4 pm (B) 4-5 pm (C)	**July 18, Thur, 3-6 pm** CNS drugs **Group 2; WW G16/G17**	Treatment of inflammation in the eye
	July 24, Wed	4-5 pm	Webst ThA	Anti-inflammatory drugs - Steroids	T. Binder					
	July 24, Wed	5-6 pm	Webst ThA	Antihistamine/mast cell stabilizers	T. Binder					
9	**July 29, Mon**	2-3 pm	Webst ThA	Anti-infective drugs – Antibacterial drugs 1	J. Liu		Anti-infectives case studies/SAQs practice	**Aug 2, Fri** 2-3 pm (A) 3-4 pm (B) 4-5 pm (C)	**Aug 1, Thur, 3-6 pm** Autonomic drugs on eye **Group 1; WW G16/G17**	
	July 31, Wed	4-5 pm	Webst ThA	Anti-infective drugs – Antibacterial drugs 2	J. Liu					
	July 31, Wed	5-6 pm	Webst ThA	Anti-infective drugs – Antiviral drugs	J. Liu					
10	**Aug 5, Mon**	2-3 pm	Webst ThA	Ocular surface disease	N. Di Girolamo		Formative quiz revision	**Aug 9, Fri** Online module	**Aug 9, Thur, 3-6 pm** Autonomic drugs on eye **Group 2; WW G16/G17**	
	Aug 7, Wed	4-5 pm	Webst ThA	Dry eyes and treatment	M. Markoulli					
	Aug 7, Wed	5-6 pm	Webst ThA	Anti-infective drugs – Antifungal drugs	J. Liu					
11	**Aug 12, Mon**	2-3 pm	Webst ThA	Ocular side effects of systemic drugs and systemic side effects of ocular drugs	J. Liu					

* Students are divided into three groups for the tutorial classes; Group A, 2-3 pm, Group B 3-4 pm and Group C 4-5 pm.

**Students are divided into two groups for the practical classes; Group 1 in Week 1, 3, 5, 7 & 9; Group 2 in Week 2, 4, 6, 8 & 10.

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