



FACULTY OF HEALTH SCIENCES AND SPORTS
BACHELOR OF SCIENCE IN BIOMEDICAL TECHNOLOGY (PHARMACY TECHNOLOGY)
LEARNING MODULE OUTLINE

Academic Year	2023/2024	Semester	2
Module Code	BSPK3102		
Learning Module	Pharmacokinetics		
Pre-requisite(s)	Nil		
Medium of Instruction	Chinese / English		
Credits	2	Contact Hours	30
Instructor	Dr. Tao Yi, Aaron	Email	yitao@mpu.edu.mo
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MODULE DESCRIPTION

This is a 30-hour course that introduces students to the basic theories and clinical application of pharmacokinetics. Students will also learn how to develop monitoring plans for certain drugs and individualize drug dosage regimens based on patients' clinical conditions.

MODULE INTENDED LEARNING OUTCOMES (ILOS)

On completion of this learning module, students will be able to:

M1.	Demonstrate an understanding of the basic concepts of Pharmacokinetics.
M2.	Define and explain various pharmacokinetic parameters and models.
M3.	Describe the processes of absorption, distribution, metabolism and excretion and apply the knowledge in clinical settings.
M4.	Solve clinical pharmacokinetic problems for some specific drugs.
M5.	Demonstrate an understanding of the relationship between pharmacokinetic parameters and pharmacological effects.
M6.	Communicate scientific concepts effectively through group discussions, demonstrating comprehension of Pharmacokinetics principles.

These ILOs aims to enable students to attain the following Programme Intended Learning Outcomes (PILOs):

PILOs	M1	M2	M3	M4	M5	M6
P1. To demonstrate understanding of a range of subjects, fields, principles and approaches relevant to pharmacy technology	✓	✓	✓	✓	✓	✓
P2. To demonstrate understanding of theories, analytical approaches and practices that underpin pharmacy operations and management	✓	✓	✓	✓	✓	✓



PILOs	M1	M2	M3	M4	M5	M6
P3. To demonstrate understanding of major trends and issues related to pharmacy technology	✓			✓	✓	✓
P4. To apply professional knowledge and skills to analyse, interpret and solve problems, challenges and risks in pharmacy practice	✓	✓	✓	✓	✓	
P5. To critically appraise and interpret scientific and clinical literature and apply evidence-based practice	✓	✓		✓	✓	✓
P6. To acquire and apply research skills in pharmacy technology		✓		✓		✓
P7. To demonstrate effective communication and teamwork skills						✓
P8. To maintain professional and ethical standards in pharmacy practice and research	✓	✓	✓	✓	✓	✓

MODULE SCHEDULE, COVERAGE AND STUDY LOAD

Week	Content Coverage	Contact Hours
1	1. Introduction to pharmacokinetics 1.1 Introduction and terminology 1.2 The ADME processes 1.3 Pharmacokinetic modeling 1.4 The rate processes	3
2	2. Intravenous bolus administration 2.1 Equations of drug elimination following IV bolus dose 2.2 Apparent volume of distribution 2.3 Elimination half life 2.4 Elimination rate constant 2.5 Monitoring drugs in urine	3
3	3. Drug elimination and clearance 3.1 Introduction to clearance and kidneys 3.2 Estimation of clearance by various models 3.3 Renal clearance 3.4 Hepatic clearance	3
4	4. Intravenous infusion 4.1 Introduction to intravenous infusion 4.2 IV infusion of one-compartment model drugs 4.3 Steady-state drug concentration and time needed to reach C _{ss} 4.4 Infusion method for calculating elimination half-life 4.5 Loading dose plus IV infusion 5. Group discussion	3
5	6. Oral administration 6.1 Pharmacokinetics of drug absorption 6.2 Zero- and first-order absorption models 6.3 Bioavailability and bioequivalence	3
8	7. Midterm exam	2
9	8. Multiple dosage regimens 8.1 Introduction and principle of superposition 8.2 Repetitive IV injections 8.3 Intermittent IV infusion 8.4 Multiple oral dosing	2



Week	Content Coverage	Contact Hours
10	9. Non-linear pharmacokinetics 9.1 Linear vs non-linear pharmacokinetics 9.2 Characteristics of drugs following nonlinear kinetics 9.3 Michaelis-Menten kinetics 9.4 Determination of Michaelis-Menten parameters: K_M and V_{max}	3
11	10. Clinical applications of pharmacokinetics: Aminoglycoside antibiotics 10.1 Introduction to aminoglycosides 10.2 Key pharmacokinetic parameters 10.3 Pharmacodynamics 10.4 Extended interval dosing 10.5 Traditional dosing	3
12	11. Group discussion and review	3
15	12. Final	2

TEACHING AND LEARNING ACTIVITIES

In this learning module, students will work towards attaining the ILOs through the following teaching and learning activities:

Teaching and Learning Activities	M1	M2	M3	M4	M5	M6
T1. Lectures with case studies and real-life examples	✓	✓	✓	✓	✓	
T2. Literature review and critical analysis	✓	✓	✓	✓	✓	✓
T3. Group discussion	✓	✓	✓	✓	✓	✓

ATTENDANCE

Attendance requirements are governed by the Academic Regulations Governing Bachelor's Degree Programmes of the Macao Polytechnic University. Students who do not meet the attendance requirements for the learning module shall be awarded an 'F' grade.

ASSESSMENT

In this learning module, students are required to complete the following assessment activities:

Assessment Activities	Weighting (%)	ILOs to be Assessed
A1. Group discussions	5	M1, M2, M3, M4, M5, M6
A2. Midterm exam	45	M1, M2, M3, M4, M5
A3. Final exam	50	M1, M2, M3, M4, M5

This learning module is graded on a 100 point scale, with 100 being the highest possible score and 50 being the passing score.



Any students scoring less than 35% of the total mark in the final examination will be given an “F” grade for the module even if the overall grade is 50% or higher.

The assessment will be conducted following the University’s Assessment Strategy (see www.mpu.edu.mo/teaching_learning/en/assessment_strategy.php). Passing this learning module indicates that students will have attained the ILOs of this learning module and thus acquired its credits.

MARKING SCHEME

Assessment Activities	Assessment Criteria	Mark Ranges				
		88-100	73-87	58-72	50-57	<50
A1. Group discussions	Demonstrate the ability to apply pharmacokinetics knowledge to analyse and interpret clinical cases, understand the relationship between pharmacokinetic parameters and pharmacological effects, and communicate scientific concepts effectively through oral presentations	Excellent	Good/ Very Good	Satisfactory	Marginal Pass	Fail; not reaching marginal levels
A2. Midterm exam	Demonstrate the ability to understand, identify, and apply appropriate pharmacokinetics concepts, knowledge, and methods	Excellent	Good/ Very Good	Satisfactory	Marginal Pass	Fail; not reaching marginal levels
A3. Final exam	Demonstrate the ability to understand, identify, and apply appropriate pharmacokinetics concepts, knowledge, and methods	Excellent	Good/ Very Good	Satisfactory	Marginal Pass	Fail; not reaching marginal levels

REQUIRED READINGS

Winter ME. 2018. *Winter’s Basic clinical pharmacokinetics*. 6th ed. Philadelphia: Wolters Kluwer Health.

REFERENCES

Shargel L, Yu A, Wu-Pong S. 2016. *Applied biopharmaceutics & pharmacokinetics*. 7th ed. New York: McGraw-Hill Medical.

Jambhekar SS, Breen PJ. 2012. *Basic pharmacokinetics*. 2nd ed. London: Pharmaceutical Press.



STUDENT FEEDBACK

At the end of every semester, students are invited to provide feedback on the learning module and the teaching arrangement through questionnaires. Your feedback is valuable for instructors to enhance the module and its delivery for future students. The instructor and programme coordinators will consider all feedback and respond with actions formally in the annual programme review.

ACADEMIC INTEGRITY

The Macao Polytechnic University requires students to have full commitment to academic integrity when engaging in research and academic activities. Violations of academic integrity, which include but are not limited to plagiarism, collusion, fabrication or falsification, repeated use of assignments and cheating in examinations, are considered as serious academic offenses and may lead to disciplinary actions. Students should read the relevant regulations and guidelines in the Student Handbook which is distributed upon the admission into the University, a copy of which can also be found at www.mpu.edu.mo/student_handbook/.