

## Course Syllabus

**offered by Department of Chemistry  
with effect from Semester A 2020/21**

This form is for the completion by the Course Leader. The information provided on this form is the official record of the course. It will be used for the City University's database, various City University publications (including websites) and documentation for students and others as required.

Please refer to the Explanatory Notes on the various items of information required.

**Prepared / Last Updated by:**

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**City University of Hong Kong  
Course Syllabus**

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**Part I Course Overview**

<b>Course Title:</b>	Medicinal Chemistry
<b>Course Code:</b>	CHEM4045
<b>Course Duration:</b>	1 semester
<b>Credit Units:</b>	3 credits
<b>Level:</b>	B4
<b>Proposed Area:</b> <i>(for GE courses only)</i>	<input type="checkbox"/> Arts and Humanities <input type="checkbox"/> Study of Societies, Social and Business Organisations <input type="checkbox"/> Science and Technology
<b>Medium of Instruction:</b>	English
<b>Medium of Assessment:</b>	English
<b>Prerequisites:</b> <i>(Course Code and Title)</i>	Nil
<b>Precursors:</b> <i>(Course Code and Title)</i>	CHEM2007/BCH2007 Principles of Organic Chemistry
<b>Equivalent Courses:</b> <i>(Course Code and Title)</i>	BCH4045 Medicinal Chemistry
<b>Exclusive Courses:</b> <i>(Course Code and Title)</i>	Nil

## Part II Course Details

### 1. Abstract

(A 150-word description about the course)

This course aims to:

- introduce drug discovery, design and development process;
- explore the interaction of drug target and drug;
- develop knowledge and techniques to identify drug targets including enzymes, receptors, and nucleic acids;
- analyse the improvement of current anticancer and antibacterial drugs;
- critically evaluate the strategy for lead identification and optimizing pharmacokinetic properties.

### 2. Course Intended Learning Outcomes (CILOs)

(CILOs state what the student is expected to be able to do at the end of the course according to a given standard of performance.)

No.	CILOs <sup>#</sup>	Weighting* (if applicable)	Discovery-enriched curriculum related learning outcomes (please tick where appropriate)		
			A1	A2	A3
1.	Describe the principles and strategies used for drug design in the drug discovery and development process.	20%		✓	
2.	Discover the principles of receptor-drug binding, enzyme inactivation, and DNA binding interactions of DNA-binding drugs.	20%	✓		
3.	Explain enzymes, receptors, and nucleic acids as drug targets and evaluate current drugs against these targets.	25%	✓		
4.	Outline the importance and the development of anticancer drugs and antibacterial drugs.	20%			✓
5.	Explain modern techniques and strategies in lead identification and optimizing pharmacokinetic properties, including target identification, structure-activity relationships, high-throughput screening, optimizing access to the target, etc.	15%		✓	
		100%			

\* If weighting is assigned to CILOs, they should add up to 100%.

<sup>#</sup> Please specify the alignment of CILOs to the Gateway Education Programme Intended Learning outcomes (PILOs) in Section A of Annex.

A1: Attitude

Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability

Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to self-life problems.

A3: Accomplishments

Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

### 3. Teaching and Learning Activities (TLAs)

(TLAs designed to facilitate students' achievement of the CILOs.)

TLA	Brief Description	CILO No.					Hours/week (if applicable)
		1	2	3	4	5	
Lectures	Students will be introduced to the principles behind a range of drug discovery techniques in lectures, with a range of examples drawn from medical and research applications.	✓					
Group activities and assignments	Students will work in small groups to present the principles of enzyme, enzyme inactivation, receptor, DNA and different DNA-binding drugs based on guided information search. Assignment will be arranged for students to demonstrate information searching ability.		✓				
Lectures	Students will be introduced to the principles, applications, processes and research methodologies to identify current drugs targets including enzymes, receptors, and nucleic acids.			✓			
Lectures	Students will be introduced to the strategies and examples of anticancer drugs and antibacterial drugs.				✓		
Lectures	Students will be introduced to the basic concepts and principles of lead identification, structure-activity relationships, and optimizing access to the target, as well as their application in drug discovery and development.					✓	

### 4. Assessment Tasks/Activities (ATs)

(ATs are designed to assess how well the students achieve the CILOs.)

Assessment Tasks/Activities	CILO No.					Weighting*	Remarks
	1	2	3	4	5		
Continuous Assessment: <u>30%</u>							
Assignment	✓	✓	✓	✓	✓	10%	
Quiz	✓	✓	✓	✓	✓	10%	
Presentation		✓				10%	
Examination: <u>70%</u> (duration: 3 hours)							
* The weightings should add up to 100%.						100%	

Starting from Semester A, 2015-16, students must satisfy the following minimum passing requirement for courses offered by CHEM:

**"A minimum of 40% in both coursework and examination components."**

## 5. Assessment Rubrics

(Grading of student achievements is based on student performance in assessment tasks/activities with the following rubrics.)

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
1. Assignment	Ability to analyze and solve problems relevant to drug structure, drug mechanism, drug design, drug synthesis, and drug-target interactions.	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Quiz	Ability to analyze and solve problems relevant to drug structure, drug mechanism, drug design, drug-target interactions, anticancer drugs, and antibiotics.	High	Significant	Moderate	Basic	Not even reaching marginal levels
3. Presentation	Ability to present clearly the discovery, production, mechanism, and other properties of a marketed drug.	High	Significant	Moderate	Basic	Not even reaching marginal levels
4. Examination	Ability to analyze and solve problems relevant to intermolecular bonding, nucleotides and nucleosides, nucleic acids as drug targets, antibiotics, anticancer drugs, drug design process and methods to establish a lead compound, structure-activity relationships, and lead identification.	High	Significant	Moderate	Basic	Not even reaching marginal levels

### Part III Other Information (more details can be provided separately in the teaching plan)

#### 1. Keyword Syllabus

*(An indication of the key topics of the course.)*

- drug discovery, design and development process: drug screening, lead compound, ADME, metabolism, clinical trials
- drug target and drug: enzyme, DNA, enzyme inactivation, competitive enzyme inhibitor, irreversible enzyme inhibitor, DNA-interactive drug, DNA intercalator, DNA alkylator, DNA strand breaker, drug combination, drug resistance, drug interaction
- target identification: active site, affinity, efficacy, potency, in vivo and in vitro tests
- anticancer and antibacterial drugs: platinum-based anticancer drugs, taxol, methotrexate, Vinca Alkaloids
- lead identification, structure-activity relationships, pharmacokinetics, and pharmacodynamics

#### 2. Reading List

##### 2.1 Compulsory Readings

*(Compulsory readings can include books, book chapters, or journal/magazine articles. There are also collections of e-books, e-journals available from the CityU Library.)*

1.	
2.	
3.	
...	

##### 2.2 Additional Readings

*(Additional references for students to learn to expand their knowledge about the subject.)*

1.	The Organic Chemistry of Drug Design and Drug Action, R. B. Silverman (Academic Press)
2.	An Introduction to Medicinal Chemistry, G. L. Patrick (Oxford, 3 <sup>rd</sup> edition)
3.	Online Resources: <a href="http://www.zhulab.com/styled-2/index.html">http://www.zhulab.com/styled-2/index.html</a>

A. Please specify the Gateway Education Programme Intended Learning Outcomes (PILOs) that the course is aligned to and relate them to the CILOs stated in Part II, Section 2 of this form:

<b>GE PILO</b>	<b>Please indicate which CILO(s) is/are related to this PILO, if any (can be more than one CILOs in each PILO)</b>
PILO 1: Demonstrate the capacity for self-directed learning	
PILO 2: Explain the basic methodologies and techniques of inquiry of the arts and humanities, social sciences, business, and science and technology	
PILO 3: Demonstrate critical thinking skills	
PILO 4: Interpret information and numerical data	
PILO 5: Produce structured, well-organised and fluent text	
PILO 6: Demonstrate effective oral communication skills	
PILO 7: Demonstrate an ability to work effectively in a team	
PILO 8: Recognise important characteristics of their own culture(s) and at least one other culture, and their impact on global issues	
PILO 9: Value ethical and socially responsible actions	
PILO 10: Demonstrate the attitude and/or ability to accomplish discovery and/or innovation	

*GE course leaders should cover the mandatory PILOs for the GE area (Area 1: Arts and Humanities; Area 2: Study of Societies, Social and Business Organisations; Area 3: Science and Technology) for which they have classified their course; for quality assurance purposes, they are advised to carefully consider if it is beneficial to claim any coverage of additional PILOs. General advice would be to restrict PILOs to only the essential ones. (Please refer to the curricular mapping of GE programme: [http://www.cityu.edu.hk/edge/ge/faculty/curricular\\_mapping.htm](http://www.cityu.edu.hk/edge/ge/faculty/curricular_mapping.htm).)*

B. Please select an assessment task for collecting evidence of student achievement for quality assurance purposes. Please retain at least one sample of student achievement across a period of three years.

<b>Selected Assessment Task</b>