CH279-15 Chemistry for Drug Discovery

26/27

Department
Chemistry
Level
Undergraduate Level 2
Module leader
Tim Bugg
Credit value
15
Module duration
10 weeks
Assessment
20% coursework, 80% exam
Study location
University of Warwick main campus, Coventry

Description

Introductory description

The module provides an introduction to medicinal chemistry at Year 2 UG level, with case studies of drug discovery from the pharmaceutical industry, and three guest lectures from external speakers.

Module web page

Module aims

The aims of the module are to introduce students to the principles of drug discovery, explaining the stages involved in the drug discovery process, and introducing the major types of biological targets for drug action, and case studies. The module includes an introduction to computational approaches to drug development, and an introduction to antibody-based drugs and the application of antibody technology for medical diagnostics.

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be

covered. Actual sessions held may differ.

1. Introduction to drug discovery process (3 lectures, 1 workshop). Overview of drug discovery process, source of lead compounds. Drug metabolism, pharmacokinetics, introduction to toxicology.
2. Enzyme catalysis & inhibition (6 lectures, 1 workshop, 1 guest lecture). Principles of protein structure, enzyme catalysis and enzyme kinetics. Examples of enzyme mechanisms, and enzymes using coenzymes (NAD, PLP). Case studies of medicinally relevant enzyme inhibitors and mechanism-based inhibitors. Beta-lactam antibiotics and antibiotic resistance.
3. Receptor agonists and antagonists (4 lectures, 1 workshop, 1 guest lecture). Case studies of drugs acting as receptor agonists and antagonists, inclusing salbutamol (asthma drug), beta-blockers (treatment for high blood pressure) and ranitidine (anti-ulcer drug).
4. Computational approaches to drug discovery (3 lectures, 1 workshop). Case studies on lead optimisation via docking, and other computational approaches to drug discovery.
5. Antibody-based drugs & molecular diagnostics (6 lectures, 1 guest lecture). Introduction to antibody structure and monoclonal antibody selection. Case studies of antibody-based drugs. Molecular diagnostics used in COVID pandemic. Discussion on ethical issues from bioactive compounds.

Learning outcomes

By the end of the module, students should be able to:

- Understand the different stages of the drug discovery process
- Apply knowledge of drug metabolism to understand why certain drug candidates might be metabolised rapidly or slowly, and how this might lead to toxicity or the design of prodrugs.
- Understand the principles of enzyme catalysis, applied to classes of drug targets such as proteases, and the mechanism of action of beta-lactam antibiotics
- Understand the mechanisms of NAD- and PLP-dependent enzymes, and be able to predict mechanisms of inactivation by mechanism-based enzyme inhibitors
- Explain receptors as drug targets, and major classes of receptor agonists and antagonists used as chemotherapeutic drugs
- Understand how computational approaches can be used in drug development
- Understand how antibody-based drugs work, and how antibodies can be used for medical diagnostics
- Critically analyse structure-activity data for drug candidates, and be able to suggest further potential chemical structures for testing.
- Present the discovery/development of a pharmaceutical drug, involving literature searching and creative presentation skills (assessed work)

Indicative reading list

Reading lists can be found in Talis

Interdisciplinary

The module teaches at the chemistry/biology interface, including topics from biochemistry,

pharmacology, toxicology, and immunology. Students will have an opportunity to explore these topics more through the assessed work assignment.

Subject specific skills

1. Understanding of principles of drug discovery, different types of drug targets, and case studies, used in pharmaceutical industry.
2. Understanding of protein structure and enzyme catalysis, underpinning knowledge for advanced modules and used in pharmaceutical and biotech industries.
3. Understanding of the application of computational methods for drug discovery, used in pharmaceutical industry.
4. Understanding of antibody technology, used in pharmaceutical and biotech industries.

Transferable skills

1. Critical analysis of structure-activity data for drug candidates, design of further potential chemical structures for testing. Used in pharmaceutical industry.
2. Written presentation of the discovery/development of a pharmaceutical drug.
3. Literature searching for discovery/development of a pharmaceutical drug.

Study

Study time

Type	Required
Lectures	25 sessions of 1 hour (17%)
Practical classes	4 sessions of 1 hour (3%)
Private study	61 hours (41%)
Assessment	60 hours (40%)
Total	150 hours

Private study description

N/A

Costs

No further costs have been identified for this module.

Assessment

You do not need to pass all assessment components to pass the module.

Students can register for this module without taking any assessment.

Assessment group D1

	Weighting	Study time	Eligible for self-certification
Assessment component			
Assessed work 1-page report on discovery/development of pharmaceutical drug	20%	30 hours	Yes (extension)
Reassessment component is the same			
Assessment component			
Centrally-timetabled examination (On-campus) Examination	80%	30 hours	No

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- Students may use a calculator
- Answerbook Pink (12 page)
- Periodic Tables

Reassessment component is the same

Feedback on assessment

Feedback on assessed work provided via Moodle. Cohort level examination feedback will be provided after the June examination period.

Past exam papers for CH279

Availability

Courses

This module is Core for:

- Year 2 of UCHA-4 Undergraduate Chemistry (with Intercalated Year) Variants
- Year 2 of UCHA-3 Undergraduate Chemistry 3 Year Variants
- Year 2 of UCHA-F110 Undergraduate Master of Chemistry (with Industrial Placement)
- Year 2 of UCHA-F109 Undergraduate Master of Chemistry (with International Placement)
- Year 2 of UCHA-4M Undergraduate Master of Chemistry Variants
- Year 2 of UCHA-F127 Undergraduate Master of Chemistry with Medicinal Chemistry(with Intercalated Year)

This module is Optional for:

- Year 2 of UCHA-4 Undergraduate Chemistry (with Intercalated Year) Variants
- Year 2 of UCHA-3 Undergraduate Chemistry 3 Year Variants
- Year 2 of UCHA-F110 Undergraduate Master of Chemistry (with Industrial Placement)
- Year 2 of UCHA-F107 Undergraduate Master of Chemistry (with Intercalated Year)
- Year 2 of UCHA-F109 Undergraduate Master of Chemistry (with International Placement)
- Year 2 of UCHA-4M Undergraduate Master of Chemistry Variants