Module Specification

Medicinal Chemistry

Version: 2024-25, v4.0, 22 May 2024

Contents

Part 1: Information

Module title: Medicinal Chemistry

Module code: USSKB5-15-2

Level: Level 5

For implementation from: 2024-25

UWE credit rating: 15

ECTS credit rating: 7.5

College: College of Health, Science & Society

School: CHSS School of Applied Sciences

Partner institutions: None

Field: Applied Sciences

Module type: Module

Pre-requisites: Cells, Biochemistry and Genetics 2023-24, Chemistry in Context 2023-24

Excluded combinations: None

Co-requisites: None

Continuing professional development: No

Professional, statutory or regulatory body requirements: None

Part 2: Description

Overview: This module investigates the impact of structure of drugs on their therapeutic action and demonstrates the effect of changing structure to their use as illicit drugs.

Pre-requisites: students must take one out of USSKA4-30-1 Cells, Biochemistry & Genetics OR USSJRT-30-1 Chemistry in Context.

Features: Not applicable

Educational aims: This module aims to develop theoretical knowledge of the use of chemistry in controlling pharmacokinetics and pharmacology of drugs. The module also aims to develop practical skills in drug synthesis and analysis.

Outline syllabus: The indicative syllabus for this module is:

The General Principles of Medicinal Chemistry:
The role of the medicinal chemist in drug design, development and discovery. Origins of drug leads, the advantages of synthesis over natural sources. Examples of strategies in medicinal chemistry to develop leads, to optimise drug-target binding interactions, to alter drug solubility/stability, to improve drug pharmacokinetics, to enhance drug delivery/formulation, to mass produce drugs and to control drug stereochemistry.

Relationships between chemical structure, physicochemical properties of a drug and predicted biological availability. Structure-activity relationships (SARs) and their quantitative measurement (QSAR). Hydrophobicity and Hammett constants, Examples of using Hansch analysis, Craig plots and Topliss decision trees in the drug development process.

Types of prodrug and the use of classical and non-classical bioisosteres. Examples of orphan and sleeping drugs. Applications to drug design and development in medicinal chemistry.

The use of X-ray crystal structure determination and spectroscopy to identify drug intermediates and to inform drug development.

Case Studies in Medicinal Chemistry:
To illustrate major classes of medicines and their chemical development and action, a selection of the following will be discussed:

-Barbiturates and the benzodiazepines

-Captopril, an antihypertensive agent – the development of a lead compound.

-The development of morphinans, methadone and fentanyl from morphine.

-Structure and activity of the antibacterial penicillins.

-Asymmetric synthesis in the production of chiral drugs.

-Structural development of the cannabinoid family - the journey from marijuana to spice and addiction to potential therapy.

-Antiulcer treatment - QSAR in the development of omeprazole or cimetidine.

Part 3: Teaching and learning methods

Teaching and learning methods: The module will be delivered using a combination of interactive lectures, workshops and laboratory practical work. Lectures will be augmented by directed reading in the recommended text and in selected publications from the scientific literature. For example, Drug Discovery Today, Journal of Medicinal Chemistry. Relevant information portals, for example, http://www.chemspider.com are also used in the module. The topics selected for delivery by workshops will be designed to enhance problem solving skills, and the practical work will provide skills and experience of laboratory techniques relevant to drug synthesis.

Module Learning outcomes: On successful completion of this module students will achieve the following learning outcomes.

MO1 Apply chemical knowledge to rationalise drug design, structural modification, synthesis and action of selected examples of medicines and drugs.

MO2 Recognise and explain how physicochemical properties of drugs can be measured, and used to study and predict their structure-activity relationships.

Hours to be allocated: 150

Contact hours:

Independent study/self-guided study = 114 hours

Face-to-face learning = 36 hours

Total = 0

Reading list: The reading list for this module can be accessed at readinglists.uwe.ac.uk via the following link https://uwe.rl.talis.com/modules/usskb5-15-2.html

Part 4: Assessment

Assessment strategy: Assessment: Portfolio (approx. 2000 words)
The assessment task for this module is a portfolio of worksheets based on work undertaken in class on the synthesis and action of selected drugs and on the principles of drug development.

The worksheets will consist of a series of questions and responses for students to complete and research in their own time. This will assess the students' knowledge acquired during lectures, workshops and practical, and from their own directed, independent learning.

Students will be enabled to succeed through support workshops and lectures and through formative feedback in the laboratory practical classes.

Assessment tasks:

Portfolio (First Sit)
Description: Worksheets with questions (2000 words).
Weighting: 100 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO1, MO2

Portfolio (Resit)
Description: Worksheets with questions (2000 words).
Weighting: 100 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO1, MO2

Part 5: Contributes towards

This module contributes towards the following programmes of study:

Biomedical Science [Frenchay] BSc (Hons) 2023-24

Biomedical Science [Frenchay] MSci 2023-24

Forensic Science [Frenchay] BSc (Hons) 2023-24

Forensic Science [Frenchay] MSci 2023-24

Biomedical Science [Sep][PT][Frenchay][6yrs] BSc (Hons) 2021-22

Biomedical Science [Sep][PT][Frenchay][8yrs] MSci 2021-22

Forensic Science {Foundation} [Frenchay] BSc (Hons) 2022-23

Forensic Science {Foundation} [Frenchay] MSci 2022-23

Biomedical Science [Frenchay] BSc (Hons) 2022-23

Biomedical Science {Foundation} [Frenchay] BSc (Hons) 2022-23

Biomedical Science [Frenchay] MSci 2022-23

Biomedical Science {Foundation} [Frenchay] MSci 2022-23