UNIVERSITY of BRADFORD

Module Descriptor

Bio-organic and Bio-inorganic Chemistry

Module Code:	CFS6014-B
Academic Year:	2018-19
Credit Rating:	20
School:	School of Chemistry and Biosciences
Subject Area:	Chemistry
FHEQ Level:	FHEQ Level 6
Module Leader:	Dr Clare Towse

Additional Tutors:
Dr Rianne Lord

Pre-requisites:

Co-requisites:

Contact Hours

Type	Hours
Lectures	24
Tutorials	12
Directed Study	164

Availability Periods

Occurrence	Location/Period
BDA	University of Bradford / Semester 1 (Sep - Jan)

Module Aims

This module will draw together organic chemistry, inorganic chemistry and biology at an advanced level with application to case studies. An advanced introduction to biomolecules will be followed by topics that investigate biological processes, with a focus on those that involve metal ions, and how synthetic molecules can interact with biomolecules as potential therapeutic agents. The properties of metals key to biological processes as well as those used in the synthesis of bioinorganic drugs, imaging and diagnostic agents will be covered

in addition to small organic drug molecules. The module will examine the chemistry that governs the use of metal ions in biological systems to develop an understanding of the underlying principles that explain the role of metal ions in bioinorganic systems.

Outline Syllabus

1. Advanced introduction to biological molecules
1a. Four major types of biomolecules:
- Carbohydrates (monosaccharides and polysaccharides),
- Lipids,
- Proteins, structure and folding
- Nucleotides and nucleic acid structures.
1b. Other classes of biomolecules, e.g. steroids and hormones

2. Nucleic acids and the ribosome
2a. Translation, transcription, nuclear enzymes

3. Enzymes and Metabolites
3a. Selected enzymes and coenzymes in biosynthetic processes
3b. Primary and secondary metabolism
3c. Metabolic pathways and regulation

4. Membranes and Ion Transport
4a. Importance of balanced distribution of elements
4b. Composition of cell membranes
4c. Mechanisms of ion transport

5. Interaction fo Synthetic Molecules with Biomolecules
5a. Basic of molecular pharmacology
5b. Kinetics and thermodynamics of binding. Basics of molecular pharmacology; enzyme inhibitors, receptor agonists and antagonists
5c. Enzyme kinetics
5d. Binding and allostery
5e. Nucleic acid - drug interactions

6. Metalloproteins and Biochemistry of Transition Metals
6a. Metals (Fe, Co, Ni, Cu, Zn) as cofactors in proteins
6b. Regulation of metal ion concentration (metalloregulation) in biological systems
6c. Iron cycle
6d. Transition state analogue inhibitors

7. Metal- and Metalloid-Carbon Bonds
7a. Organometallic compounds and transition metals - synthesis and interactions
7b. Carbon bonds to main group metals and metalloids

8. Inorganics and Medicine
8a. Metals and metalloids
8b. Importance of iron and copper
8c. Metals and metalloids in therapy
8d. Metals in the treatment of disease

9. Radiopharmaceuticals
9a. Introduction to the f-elements

9b. Introduction fo fluorescence and luminescence
9c. Metals and metalloids in diagnostic imaging
9d. MRI and contrast agents

Module Learning Outcomes

On successful completion of this module, students will be able to...

1 Demonstrate breadth. depth of awareness and understanding of biological and therapeutically relevant metals within the periodic table that underpin current bioinorganic research.

2 Explain and critically discuss the importance of metal ions in biological process and the chemistry underlying their therapeutic use in bioinorganic drugs.

3 Select and explain key aspects of enzymology and analyse kinetic data for enzyme-catalysed reactions and devise arguments based on physicochemical effects and mechanisms.

4 Explain and discuss the chemical properties underlying the use of metals as diagnostic agents in medical contexts.

5 Illustrate the reaction schemes for the synthesis of subject-specific compounds and identify their structures and properties.

6 Demonstrate interpersonal skills through the means of group and independent work, by critically evaluating case studies.

Learning, Teaching and Assessment Strategy

Lectures will deliver core content and provide you with the opportunity to enhance your knowledge and understanding of inorganic and organic chemistry within a biological context. Lectures will be complemented by seminars, group discussions and tutorials to allow you to apply this learning to specific case studies and problems.
Directed study will provide you with the opportunity to undertake guided reading and develop in-depth understanding of the subject material. You will develop your professional and transferable skills through the means of group work in a tutorial setting. You will critically analyse case studies and enhance your interpersonal skills through group research and preparation of individual research communication articles.
The VLE will be used to provide access to online resources, lecture notes and external links to websites of interest.
Assessment 1: Case study presented as a communication article.
Assessment 2: Summative examination to cover the whole module.

Mode of Assessment

Type	Method	Description	Length	Weighting	Final Assess'

Summative	Examination - closed book	Summative Assessment: Closed Book	2 hours	70%	Yes
Summative	Coursework	Case study article (1500-2000 words)	1500-2000 words	30%	No

Legacy Code (if applicable)

CT-3512D

Reading List

To view Reading List, please go to **rebus:list**.