

Module Details	
Module Title	Bio-organic and Bio-inorganic Chemistry (at distance)
Module Code	CFS6027-B
Academic Year	2022/3
Credits	20
School	School of Chemistry and Biosciences
FHEQ Level	FHEQ Level 6

Contact Hours	
Type	Hours
Online Lecture (Synchronous)	12
Directed Study	162
Online Tutorials (Synchronous)	4
Practical Classes or Workshops	4
Interactive Learning Objects	18

Availability	
Occurrence	Location / Period
DLA	University of Bradford / Semester 1

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 used in the synthesis of bioinorganic drugs, imaging and diagnostic agents will be covered and students 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

Biomolecule Structure and Function: Four major classes of biomolecules (carbohydrates, nucleic acids, proteins and lipids) and monomer constituents; biomolecular interactions; protein folding and misfolding; nucleic acid structures; carbohydrate stereochemistry and reactivity.

Genetic Flow of Information: DNA replication; protein biosynthesis (translation and transcription) and nuclear enzymes.

Molecular recognition and interactions: interactions between biomolecules; kinetics and thermodynamics of binding; allostery; receptor agonists and antagonists; drug interactions.

Membranes and Ion Transport: structure and composition of cell membranes; mechanisms of ion transport.

Enzymes: enzymes and coenzymes in biosynthetic processes; classification of enzymes; enzyme kinetics (Michaelis-Menten and non Michaelis-Menten behaviour); enzyme inhibition; metalloproteins and metals (Fe, Co, Ni, Cu, Zn) as cofactors in proteins; transition state analogue inhibitors.

Biochemistry of Transition Metals and Homeostasis: Importance of balanced distribution of elements; essential elements; regulation of metal ion concentration (metalloregulation); role of (transition) metals in biology.

Medicinal Bioinorganic Chemistry: anti-cancer metal-based drugs; chelation therapy; anti-inflammatory metalbased drugs; vaccines and adjuvants;

Metals and Metalloids in Diagnostic Imaging: Introduction to fluorescence and luminescence; MRI and contrast agents; introduction to radionuclides; metal-based radiopharmaceuticals for PET and SPECT.

Learning Outcomes	
Outcome Number	Description
01	Discuss and detail the structure and function of the four classes of biological molecules, including the assembly of supramacromolecular structures from constituent monomers and subunits.
02	Discuss and describe how nucleic acids enable the storage, replication and expression of genetic information.
03	Explain and critically discuss specific modes of binding and the molecular recognition by biomolecules of substrates, ligands and therapeutics.
04	Demonstrate breadth, depth of awareness and understanding of the chemistry and biochemistry of metals and how this can be applied in development of bioinorganic therapeutics.
05	Explain the role of enzymes and key aspects of enzymology, analyse kinetic data and devise arguments based on physicochemical effects and mechanisms.
06	Explain and critically discuss the importance of metal ions in biological processes, including transport mechanisms, homeostasis and metalloregulation, and the health consequences of dysregulation.
07	Demonstrate breadth, depth of awareness and understanding of the chemistry of metals that underlay their use in medical imaging and as diagnostic agents.
08	Illustrate the reaction schemes for the synthesis of subject-specific compounds and identify their structures and properties.
09	Demonstrate breadth and depth of understanding on a selected topic in bioorganic and bioinorganic chemistry and communicate findings in writing, observing appropriate professional conventions in chemistry.
10	Critically evaluate and select data and literature sources based on accuracy and relevance to a selected topic in bioorganic and bioinorganic chemistry.

Learning, Teaching and Assessment Strategy
Online learning packages will deliver core content; providing you with the opportunity to acquire the information to enhance your knowledge and understanding. This will be complemented by online lectures and tutorials to allow you to apply this learning to specific exemplar problems. Online workshops will guide you in the selection of a topic from within bioorganic and bioinorganic chemistry, researching and writing a mini-review article on this topic. Directed study provides you with the opportunity to undertake guided reading and to develop your own portfolio of learning to enhance transferable skills. Assessment 1: Mini-review article. LOs 1-10 Assessment 2: Summative examination. LOs 1-8

Mode of Assessment			
Type	Method	Description	Weighting
Summative	Examination - Closed Book	Examination (2 Hrs)	70%
Summative	Coursework - Written	Mini-review article	30%

Reading List

To access the reading list for this module, please visit <https://bradford.rl.talis.com/index.html>

Please note:

This module descriptor has been published in advance of the academic year to which it applies. Every effort has been made to ensure that the information is accurate at the time of publication, but minor changes may occur given the interval between publishing and commencement of teaching. Upon commencement of the module, students will receive a handbook with further detail about the module and any changes will be discussed and/or communicated at this point.

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