1. **Title of the module**

BIOS3221 / BIOS3220 (BI322/BI3220) - Biological Chemistry B

1. **School or partner institution which will be responsible for management of the module**

Biosciences

1. **The level of the module (Level 4, Level 5, Level 6 or Level 7)**

Level 4

1. **The number of credits and the ECTS value which the module represents**

30 credits (15 ECTS)

1. **Which term(s) the module is to be taught in (or other teaching pattern)**

Autumn and Spring

1. **Prerequisite and co-requisite modules**

None

1. **The programmes of study to which the module contributes**

BSc Biomedical Science and related programmes

BSc Biochemistry and related programmes

1. **The intended subject specific learning outcomes.
On successfully completing the module students will be able to:**

Have a knowledge and understanding of:

8.1 Fundamental concepts of atoms, molecules, states of matter, basic valences, bonding and molecular interactions, basic organic compounds, shapes and basic isomerism and reactivity and chemical and the relevance of these concepts toward biomedical science. (Phase 1)

8.2 The molecular basis of the thermodynamics of chemical and biochemical reactions, an understanding of equilibria and an appreciation of detailed molecular bonding and equilibria applied to biological systems. (Phase 2)

8.3 Fundamental concepts of organic chemistry related to biological systems including carbon functional group chemistry (alkanes, alkyl halides, alkenes, alkynes, aromatics, heterocyclics and carbonyl compounds), bioinorganic chemistry including the role of chemistry to understand biochemical processes. (Phase 3)

8.4 Analytical spectroscopy and Chemical Biology. The use of spin-resonance spectroscopies in biology, amino acid, protein and enzyme chemistry and chemical biology concepts including metabolic function of globins, sugars, phosphates. (Phase 4)

1. **The intended generic learning outcomes.
On successfully completing the module students will be able to:**

9.1 Have understanding and knowledge of problem solving, especially numerical and chemical methods.

1. **A synopsis of the curriculum**

Students without A2 Chemistry (equivalent) on entry take Phases 1+2+3

Students with A2 Chemistry (equivalent) on entry take Phases 2+3+4

N.B. Students with A2 Chemistry or equivalent below grade C will follow Phases 1+2+3

This approach allows fundamental concepts (Phase 1) to be taught to non-A2 Chemistry students. Biology students with A2 Chemistry (or equivalent) will obtain additional chemical concepts (Phase 4) as their chemistry qualification at A2 will already furnish them with concepts from Phase 1. All students will participate in the core section: Phase 2.

Phases 2+3+4 students will use the Phase 1 coursework test as a formative assessment to recognise their required chemical knowledgebase as obtained at A2 level. This provides an opportunity to identify students requiring additional support.

This module links to Biological Chemistry A with identically designed phases (1, 2 and 3) to maximise teaching efficiency across all programs in the School of Biosciences.

Phase 1: Autumn Term (5 lectures, 6 x 2 hr Workshops)

Basic chemical concepts for biology will be taught and applied through examples in a workshop atmosphere. The five workshop topics covered are: (i) Atoms and states of matter (ii) valence and bonding (iii) basic organic chemistry for biologists (iv) molecular shapes and isomerism in biology and (iv) chemical reactivity and chemical equations.

Assessment feedback of basic chemistry (1 session/lecture)

Phase 2: Autumn Term (9 lectures, 2 x 2 hr Workshop, 3 extra support lectures)

Chemical and biochemical thermodynamics. Topics covered are: (i) energetic and work, (ii) enthalpy, entropy and the laws of thermodynamics (iii) Gibbs free energy, equilibrium and spontaneous reactions, (iv) Chemical and biochemical equilibrium (including activity versus concentration and Le Chatelier’s principle). The two hour workshop is designed to be delivered as small group sessions to cover the applications and practice of thermodynamics concepts.

Chemistry applied to biological concepts: bonding, valence, hybridisation as well as biological applied thermodynamic process (biomolecular association/dissociation).

Assessment feedback (1 session/lecture)

Phase 3: Spring Term (17 lectures, 2 x 2 hr workshop)

Fundamental organic chemistry with biological examples. Topics covered: (i) Introduction and basic functional chemistry, (ii) Isomerism and stereochemistry, (iii) Reaction mechanisms, (iv) Alkanes/alkyl halides/alkenes/alkynes, (v) Aromatic compounds, (vi) Heterocyclic compounds, (vii) Amines and alcohols (viii) Carbonyl compounds and carboxylic acids and (ix) Biological inorganic chemistry. The two workshops is designed to be delivered as small group sessions to cover the applications of reaction mechanisms and reaction schemes.

Phase 4: Spring Term (8 lectures, 2 x 1 hr workshop)

Advanced topics for A2 Chemistry entrants for Biochemistry and Biomedical Science. Topics covered: (i) Uses of spin-resonance spectroscopies in Biology, (ii) Proteins and Amino Acid Chemistry in enzymes, (iii) Chemical Biology concepts: Globins: structure/function, sugars and phosphates, metabolism and biochemistry.

Assessment feedback (1 session/lecture)

1. **Reading list (Indicative list, current at time of publication. Reading lists will be published annually)**
* Phase 1+2: Crowe and Bradshaw. Chemistry for the Biosciences (3rd Ed.). The essential concepts. (OUP)
* Phase 2+3: Burrows, Holman, Parsons, Pilling and Price. Chemistry3: Introducing Organic, Inorganic and Physical Chemistry (3rd Ed.). (OUP)
* Phase 4: Dobson, Gerrard and Pratt. Foundations of Chemical Biology. (OUP Primer)
1. **Learning and teaching methods**

Phase 1+2+3 students:

Total contact hours: 56

Private study hours: 244

Total study hours: 300

Phase 2+3+4 students:

Total contact hours: 50

Private study hours: 250

Total study hours: 300

1. **Assessment methods**
	1. Main assessment methods

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Assignment (10%): Phase 2 test with 20 MCQ and 1 Problem Question

Assignment (15%): Phase 2 Coursework Problem question

Coursework (25%): Phase 4 Coursework Problem Questions

Exam (50%) 30 MCQ and 1 Problem Question from choice of 3

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Assignment (20%): Phase 1 test with 20 MCQ

Assignment (20%): Phase 2 test with 20 MCQ and 1 Problem Question

Coursework (30%): Phase 1 Coursework Problem question

Coursework (30%): Phase 2 Coursework Problem question

Exam (50%) 30 MCQ and 1 Problem Question from choice of 3

13.2 Reassessment methods

BIOS3220

Reassessment Instrument: 100% exam

BIOS3221

Reassessment Instrument: 100% exam

1. **Map of module learning outcomes (sections 8 & 9) to learning and teaching methods (section12) and methods of assessment (section 13)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Module learning outcome** | *8.1* | *8.2* | *8.3* | *8.4* | *9.1* |
| **Learning/ teaching method** |  |  |  |  |  |
| **Private Study phase 1+2+3** | **X** | **X** | **X** |  | **X** |
| *Lectures and Workshops Phase 1+2+3* | **X** | **X** | **X** |  | **X** |
| **Private Study phase 2+3+4** | **X** | **X** | **X** | **X** | **X** |
| *Lectures and Workshops Phase 2+3+4* | **X** | **X** | **X** | **X** | **X** |
| **Assessment method** |  |  |  |  |  |
| *MCQ test phase 1* | **X** |  |  |  |  |
| *Coursework phase 1* | **X** |  |  |  | **X** |
| *Assessment test phase 2* |  | **X** |  |  | **X** |
| *Coursework phase 2* |  | **X** |  |  | **X** |
| *Course work phase 4* |  |  |  | **X** | **X** |
| *Examination* | **X** | **X** | **X** | **X** | **X** |

1. **Inclusive module design**

The School recognises and has embedded the expectations of current equality legislation, by ensuring that the module is as accessible as possible by design. Additional alternative arrangements for students with Inclusive Learning Plans (ILPs)/declared disabilities will be made on an individual basis, in consultation with the relevant policies and support services.

The inclusive practices in the guidance (see Annex B Appendix A) have been considered in order to support all students in the following areas:

a) Accessible resources and curriculum

b) Learning, teaching and assessment methods

1. **Campus(es) or centre(s) where module will be delivered**

Canterbury

1. **Internationalisation**

Chemistry is an international discipline. This module presents subject-specific knowledge, research approaches and techniques, generated, developed and refined by scientists around the world. Mastery of the learning outcomes will equip students to apply the theories and techniques of the module in a wide range of international contexts. In compiling the reading list, consideration has been given to the range of texts that are available internationally and a selection has been identified to complement the delivery of the material. The School of Biosciences is an international community of students and staff. Group activities e.g. in practicals, tutorials, workshops and self-study will naturally draw on the international make-up of the student body; the module teaching team includes members with international experience of teaching and research collaboration.

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**Revision record – all revisions must be recorded in the grid and full details of the change retained in the appropriate committee records.**

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| --- | --- | --- | --- | --- |
| Date approved | Major/minor revision | Start date of the delivery of revised version | Section revised | Impacts PLOs (Q6&7 cover sheet) |
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Revised FSO Jan 2018