

FP046-15 Chemistry for the Biosciences

22/23

Department

Warwick Foundation Studies

Level

Foundation

Module leader

Harnak Rayat

Credit value

15

Module duration

24 weeks

Assessment

100% coursework

Study location

University of Warwick main campus, Coventry

Description

Introductory description

Knowledge of structure and function in biological systems underpinned by the chemical structures, reactions and interactions of the molecules involved. This module provides a background in chemistry for students wishing to study Life Science or Psychology at Undergraduate level. The material is illustrated in case studies relevant to these students.

Module aims

This module presents students with an introduction in fundamental ideas and concepts in chemistry for students wishing to study subjects involving molecular science. The module aims to provide students with an appreciation of the structure and function of molecules, principles of kinetics, pH and chemical analysis with the application of these to biological systems. In addition, skills aligned to the chemical sciences including numeracy, logical argument, research, referencing and the utilisation of modelling will be developed.

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.

Student will cover:

Introduction: Chemical Basis of Living Systems

- Atomic structure and the Periodic table
- Energy of the Atom: Ionization Energies, Shells, Vacancy, orbitals and bonding
- Biomolecules: Electronic Structure and Shape (VESPER)
- Electronegativity and Intermolecular bonding
- The mole, calculating concentration and expressing biochemical results
- Transition Metals: Complexes and ligands

Biomolecules

- Proteins, amino acids and making polymers
- Intermolecular bonding and solubility
- Carbon chemistry: functional groups and nomenclature
- Reactions and reaction mechanisms: including; aldehydes, ketones, carboxylic acids, alcohols
- Energetics, Entropy and determining the reaction feasibility (ΔH , ΔS and ΔG)
- The Equilibrium constant, calculating K

Balance and disruption in biological systems

- pH regulation of the stomach, Bronsted acids and bases
- Strong and weak acids, K_a and K_{pa} calculations
- Buffers: definitions, calculations and the role of antacids
- Hydrogen carbonate and carbonate buffers

Acid base reactions: Drug production and detection

- Producing Aspirin: percentage yield and purity
- Drug regulation, production, chirality and Isomerism
- NMR and detecting impurities
- Mass spectrometry (e.g. steroids), Infrared spectroscopy and alcohol detection
- Redox reactions

Bioenergetics

- Electrochemical cells
- Reaction feasibility
- The chemistry of biological membranes

Learning outcomes

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

- Students should demonstrate an appreciation and mastery of the foundation of key organic reactions and their mechanisms

- Students should be able to use chemical concepts to predict the reactivity and properties of key elements and compounds found in biological systems
- Students should be competent in the manipulation and interpretation of numerical data and be able to identify factors that influence biological reactions
- Students should be able to analyse acid-base phenomena and their effects in order to produce relevant conclusions
- Students should be able to deduce different functional groups in biological macromolecules using Instrumental analysis

Indicative reading list

Chemistry for the life sciences (2009) Raul Sutton; Bernard Rockett; Peter Swindells

Chemistry for the biosciences : the essential concepts (2014) Jonathan Crowe, Tony Bradshaw

Interdisciplinary

This module links ideas and concepts delivered in the Biology and Psychology modules taken by students. The final assessment will require students to draw on and apply learning from across these modules.

Subject specific skills

Students will develop a core understanding of key chemical concepts, with a focus on the application of these fundamental principles within the bio-sciences.

Students will develop a familiarity with the language and terminology of chemistry.

Students will be encouraged to think creatively and critically and identify trends and patterns.

Transferable skills

Students will develop their research, organisational, time management, team working, IT and oral communication skills.

Students will develop effective communication for different target audience through written, oral and visual means.

Students will learn to select and manage information drawn from books, journals, and the internet.

Students will learn to make value judgements about their own work and the work of peers.

Study

Study time

Type	Required
Seminars	24 sessions of 2 hours (32%)
Private study	52 hours (35%)
Total	150 hours

Type	Required
Assessment	50 hours (33%)
Total	150 hours

Private study description

To develop new knowledge and understanding for this module students should undertake activities such as reading in relation to the subject areas covered, critical analysis of data and articles, reflection, practice questions, group work and preparation for assignments.

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Assessment group A2

	Weighting	Study time
Biochemistry: MCQ and Short answer questions A set of questions requiring students to demonstrate their knowledge and understanding of key concepts	35%	15 hours
Inquiry Exercise This assessment will required students to apply their knowledge to a inquiry-based learning exercise and produce a written report providing evidence for their conclusion.	65%	35 hours

Feedback on assessment

Students will be provided with formative assessments that will give 'feed-forward' comments to support the assessments in both written and verbal formats. On summative assessment students will receive written 'feed-forward' comments through Tabula.

Availability

Courses

This module is Core for:

- FIOE Warwick International Foundation Programme
 - Year 1 of FP21 Warwick International Foundation Programme - Life Sciences
 - Year 1 of FP22 Warwick International Foundation Programme - Psychology