

## School of Chemistry

### Aims and Objectives: Session 2023-2024, Semester 2

#### Module CH1601: Organic and Biological Chemistry 1

**Course Title:** Biological Chemistry

**Duration:** 10 hours

**Lecturer:** Professor D. O'Hagan

**Aims:** To introduce the students to organic molecules of biological importance and to describe their chemical properties, relating these to the rest of organic chemistry. To show how the large polymeric molecules (proteins, nucleic acids) are made up of smaller units and to discuss their structure and function. To gain an appreciation of the importance of these macromolecules in cellular processes and diseases.

#### Objectives:

1. To appreciate that simple organic chemistry, and structure and bonding principles underpin the chemistry of life.
2. To gain a basic understanding of the chemistry of life and an overview of metabolism, including transcription and translation.
7. To understand the zwitterionic properties of amino acids.
8. To examine the chemical characteristics of the 20 common amino acids, and to know their names, abbreviations, structures and properties.
9. To understand how the peptide bond is formed, chemically and biologically, its properties and the consequences for protein and peptide structure and reactivity.
10. To examine the secondary, tertiary and quaternary structures adopted by polypeptides in the formation of proteins, and the physical chemistry restraints on protein folding and the thermodynamics of folding.
11. To gain a basic understanding of what enzymes are and how they function.
12. To understand what is meant by the term lipid and what these compounds have in common.

13. To know the structure of triglycerides and their reactions (saponification, addition and hydrogenation).
14. To understand the general structure and role of steroids in biological systems.
15. To fully understand the structure of glucose in its open chain and cyclic forms. Understand what is meant by a monosaccharide.
16. To understand what is meant by a disaccharide.
17. To be able to identify pentoses, hexoses, heptoses etc. To be able to identify and discriminate ketoses and aldoses in both straight chain and cyclized form.
18. To understand the convention for naming the enantiomers of the monosaccharides *via* D- and L-glyceraldehyde.
19. To understand the chemical reactions of monosaccharides (oxidation, reaction with alcohols, reaction with other sugars).
20. To understand the structures of polysaccharides (cellulose, starch and glycogen) and know about their biological function.
21. To see how bases, ribose sugars and phosphate groups link to form polynucleotide structures: deoxyribonucleic acid (DNA), ribonucleic acid (RNA).
22. To examine the structural variability of polynucleotides: double helical structures, transfer-RNA structures and chromatin, and to gain some appreciation of the manipulation of these structures in the processing of genetic formation.