CHE00012I Biochemical Reaction Mechanisms

Organiser: Dr Gideon Grogan

Synopsis: for 2015/16

Prerequisites:

Aims
The course aim is to equip the student with a basic knowledge of the molecular chemistry that underpins enzymatic reactions.

Learning outcomes
Detailed learning objectives are provided to the student in the handouts for the four course sections (see below). At the end of the course, the student should be able to recognize, describe and apply the variety of chemistry that occurs within enzyme reactions with reference both to general principles and specific examples of, particularly: the hydrolysis of amides, glycosides and phosphates, metalloenzymes; NAD(P)H and FAD/FMN-dependent oxidoreductase reactions; Reactions involving the cofactors PLP and TDP.

Summary
This course builds on preliminary studies of mechanistic organic chemistry and enzyme-catalysed reactions from Year 1. The scope of chemical catalysis observed in biochemical reactions will be explored, with an emphasis on the molecular mechanisms by which they are achieved. After an introduction and revision of the basic principles of enzymatic catalysis (transition state theory, general acid/base, covalent and electrostatic catalysis, kinetics) the major types of enzyme-catalysed reaction mechanism will be illustrated with reference to examples of physiological, medicinal and biotechnological relevance. The course is divided into four sections:

1. Introduction (Gideon Grogan)
2. Hydrolytic Reactions (Gideon Grogan)
3. Metalloenzymes (Alison Parkin)
4. Organic Cofactors (NAD(P)H, FAD/FMN, PLP, TDP) (Gideon Grogan)

Examples will feature experimental techniques for mechanistic investigations and illustrate how an understanding of mechanism is vital to the inhibition or improvement of enzyme activity for therapeutic or biotechnological ends.

FORMATIVE ASSESSMENT:
SUMMATIVE ASSESSMENT: closed examination in the Spring Term (70% of the total mark) plus a continuous assessment assignment to be completed in the Autumn Term (30% of the total mark).

RE-ASSESSMENT: