

Enzyme Design

LUR ALONSO-COTCHICO, JAIME RODRÍGUEZ-GUERRA,
AGUSTÍ LLEDÓS AND JEAN-DIDIER MARÉCHAL*

Departament de Química, Universitat Autònoma de Barcelona,
08193 Cerdanyola del Vallès, Spain

*Email: jeandidier.marechal@uab.cat

15.1 Introduction

Enzymes are one of the cornerstones of living organisms. They are catalysts that provide the catabolic and metabolic needs of the cells and the number of physiological processes they are involved in is legion. From their primary sequence to their expression, enzymes are one of the most important markers of evolution as they are modulated according to the necessities of cells. Amongst the examples that crystallise the importance of enzymes for living organisms is their involvement in frontline mechanisms of cellular defence. Cells would not be able to promptly respond to harmful stimuli generated by their surrounding (*i.e.* the absorption of pathogenic molecules) without a battery of efficient enzymes.¹

Millions of years of evolution have led enzymes to display properties that are of the most complex to achieve by man-made catalysts. They have great substrate and catalytic selectivity and specificities. Enzymes tend to catalyse the reactions they are specifically designed for on a narrow scope of substrates and at a very well-defined position. They carry out their function with a minimum of by-products so that wastage of vital resources is reduced to a minimum and the formation of potentially harmful compounds is avoided to protect the organism. The particularity of enzymes in term of chemical specificity added to their capacities to work under mild conditions and water