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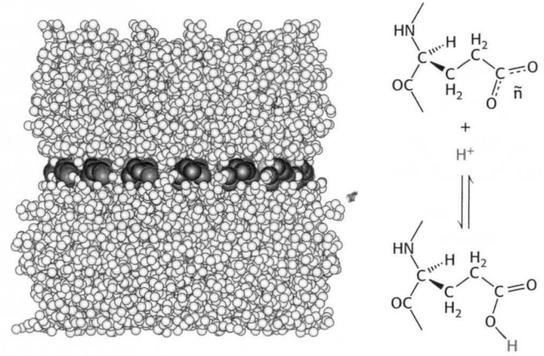
CHAPTER 1

Biochemistry: An Evolving Science



Chemistry in action. Human activities require energy. The interconversion of different forms of energy requires large biochemical machines comprising many thousands of atoms such as the complex shown above. Yet, the functions of these elaborate assemblies depend on simple chemical processes such as the protonation and deprotonation of the carboxylic acid groups shown on the right. The photograph is of Nobel Prize winners Peter Agre, M.D., and Carol Greider, Ph.D., who used biochemical techniques to study the structure and function of proteins. [Courtesy of Johns Hopkins Medicine.]

Biochemistry is the study of the chemistry of life processes. Since the discovery that biological molecules such as urea could be synthesized from nonliving components in 1828, scientists have explored the chemistry of life with great intensity. Through these investigations, many of the most fundamental mysteries of how living things function at a biochemical level have now been solved. However, much remains to be investigated. As is often the case, each discovery raises at least as many new questions as it answers. Furthermore, we are now in an age of unprecedented opportunity for the application of our tremendous knowledge of biochemistry to problems in medicine, dentistry, agriculture, forensics, anthropology, environmental sciences, and many other fields. We begin our journey into biochemistry with one of the most startling discoveries of the past century: namely, the great unity of all living things at the biochemical level.

OUTLINE

1.1 Biochemical Unity Underlies Biological Diversity

1.2 DNA Illustrates the Interplay Between Form and Function

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1.1 Biochemical Unity Underlies Biological Diversity

The biological world is magnificently diverse. The animal kingdom is rich with species ranging from nearly microscopic insects to elephants and whales. The plant kingdom includes species as small and relatively simple