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Index Inorganic chemistry, explores the chemical and physical properties and biological functions of inorganic compounds. Inorganic compounds are metal ions and metal compounds of variable complexity, such as sulfate, phosphate, and the organometallic and organometalloid compounds involved in biological processes such as digestion and excretion, and the oxides of carbon, nitrogen, sulfur, and phosphorus. All of these inorganic ions and molecules can play an essential role in biological functions. They are therefore essential for sustaining life—as long as homeostasis is not disrupted. Conversely, the dysfunction of life processes can be attributed to an underavailability or oversupply of inorganics, either through malnutrition or as a result of disturbance caused by genetic and/or effects related to environmental and dietary imbalances or diseases. An estimated one-third of the proteins, and one-half of all enzymes, which collectively perform a variety of tasks, contain metal ions. Many of these enzymatic processes govern redox reactions on the one hand, and processes involving the making and breaking of bonds in respect to the formation and disruption of organic (and inorganic) molecules by non-redox processes on the other. Coordination and hydrolysis are other reactions in this respect, in order for metal ions to become recruited, to locate their target molecules and to be incorporated. Organisms require suitable recognition and transport systems. Transport systems that have available coordination sites that match the metal ion and its oxidation state. Life processes involve (i) metabolism—the chemical transformation of matter coupled with energy production or consumption, (ii) replication/reproduction (coupled to the storage and transfer of information), and (iii) evolutionary modulation—the optimization of the chances of survival in a given habitat and the adjustment to changing environmental conditions. Evolutionary adaption is achieved by mutation within the individual gene pool, and by horizontal gene transfer between different (bacterial) species.

Inorganic processes, intrinsically linked to biochemical reactions, participate at all these levels. In this context, during this book we also focus on environmental and medicinal concerns. Examples of 'inorganics' in medicine include the treatment of certain types of cancer with platinum prescriptions and the use of paramagnetic gadolinium and radioactive technetium compounds in diagnosis.

The present book arises from a lecture course called 'Bioinorganic Chemistry', delivered by the author during the past two decades at the University of Hamburg, Germany, and, in 2008, at the University of Lund, Sweden. The idea for the book was initiated by Ebbe Nordlander, Lund University, who also had been involved in developing the original concept of this book.

Structuring the wealth of material has been a particularly challenging task. For an inorganic chemist, it is tempting to arrange the material according to elements. In biology, however, the focus is often on function. A combination of these two approaches has been pursued in the present book: elements that have a pivotal role in (almost) all biological functions (alkaline and alkaline earth metals, iron, zinc, and sulfur) are addressed in separate chapters, while other chapters are dedicated to functional processes. Examples of the latter are oxido-reductases, enzymes of the nitrogen cycle, and photosynthesis, while the general role of oxygen is