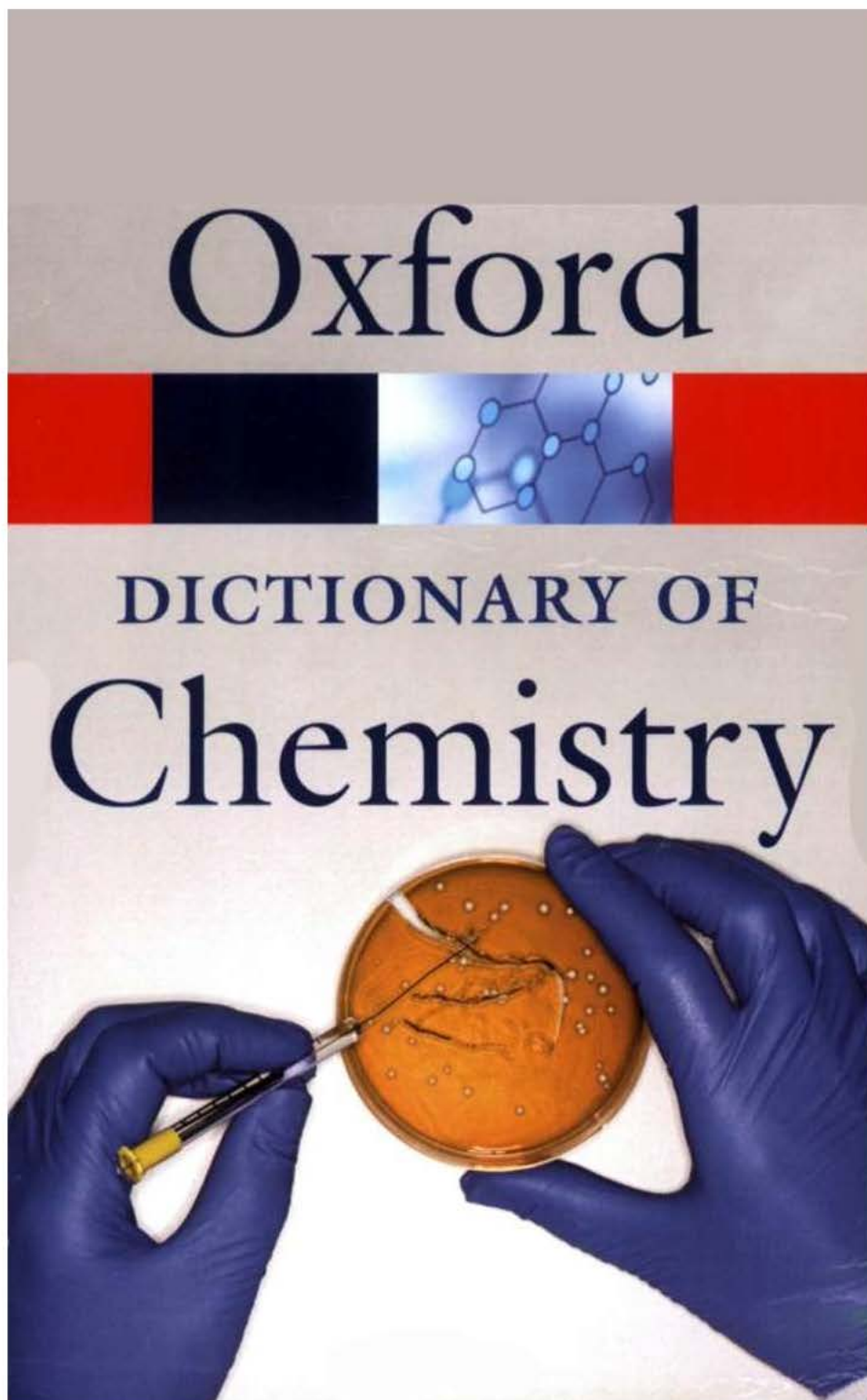




A Dictionary of
Chemistry

SIXTH EDITION

Edited by
JOHN DAINTITH

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Preface

This dictionary was originally derived from the *Concise Science Dictionary*, first published by Oxford University Press in 1984 (fifth edition, retitled *Dictionary of Science*, 2005). It consisted of all the entries relating to chemistry in this dictionary, including physical chemistry, as well as many of the terms used in biochemistry. Subsequent editions included special feature articles on important topics as well as several chronologies tracing the history of some topics and short biographical entries on the chemists and other scientists who have been responsible for the development of the subject. For this sixth edition the text has been fully revised and some entries have been substantially expanded. In addition over 350 new entries have been added covering all branches of the subject. The coverage of certain fields, in particular biochemistry, forensic chemistry, and chemoinformatics, has been expanded. A further improvement has been the inclusion of about 90 additional chemical structures.

An asterisk placed before a word used in an entry indicates that this word can be looked up in the dictionary and will provide further explanation or clarification. However, not every word that appears in the dictionary has an asterisk placed before it. Some entries simply refer the reader to another entry, indicating either that they are synonyms or abbreviations or that they are most conveniently explained in one of the dictionary's longer articles or features. Synonyms and abbreviations are usually placed within brackets immediately after the headword. Terms that are explained within an entry are highlighted by being printed in boldface type.

The more physical aspects of physical chemistry and the physics itself will be found in *A Dictionary of Physics*, which is a companion volume to this dictionary. *A Dictionary of Biology* contains a more thorough coverage of the biophysical and biochemical entries from the *Dictionary of Science* together with the entries relating to biology.

SI units are used throughout this book and its companion volumes.

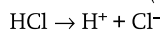
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ionization of a solvent the ionic product is also called the **autoprotolysis constant**. See also SOLUBILITY PRODUCT; PH SCALE.

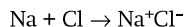
ionic radius A value assigned to the radius of an ion in a crystalline solid, based on the assumption that the ions are spherical with a definite size. X-ray diffraction can be used to measure the internuclear distance in crystalline solids. For example, in NaF the Na – F distance is 0.231 nm, and this is assumed to be the sum of the Na⁺ and F[–] radii. By making certain assumptions about the shielding effect that the inner electrons have on the outer electrons, it is possible to assign individual values to the ionic radii – Na⁺ 0.096 nm; F[–] 0.135 nm. In general, negative ions have larger ionic radii than positive ions. The larger the negative charge, the larger the ion; the larger the positive charge, the smaller the ion. See also HYDRODYNAMIC RADIUS.

ionic strength Symbol *I*. A function expressing the effect of the charge of the ions in a solution, equal to the sum of the molality of each type of ion present multiplied by the square of its charge. $I = \sum m_i z_i^2$.

ionization The process of producing *ions. Certain molecules (see ELECTROLYTE) ionize in solution; for example, *acids ionize when dissolved in water (see also SOLVATION):



Electron transfer also causes ionization in certain reactions; for example, sodium and chlorine react by the transfer of a valence electron from the sodium atom to the chlorine atom to form the ions that constitute a sodium chloride crystal:

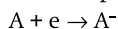


Ions may also be formed when an atom or molecule loses one or more electrons as a result of energy gained

in a collision with another particle or a quantum of radiation (see PHOTOIONIZATION). This may occur as a result of the impact of *ionizing radiation or of thermal ionization and the reaction takes the form



Alternatively, ions can be formed by electron capture, i.e.



ionization energy (IE) See IONIZATION POTENTIAL.

ionization gauge A vacuum gauge consisting of a three-electrode system inserted into the container in which the pressure is to be measured. Electrons from the cathode are attracted to the grid, which is positively biased. Some pass through the grid but do not reach the anode, as it is maintained at a negative potential. Some of these electrons do, however, collide with gas molecules, ionizing them and converting them to positive ions. These ions are attracted to the anode; the resulting anode current can be used as a measure of the number of gas molecules present. Pressure as low as 10^{–6} pascal can be measured in this way.

ionization potential (IP) Symbol *I*. The minimum energy required to remove an electron from a specified atom or molecule to such a distance that there is no electrostatic interaction between ion and electron. Originally defined as the minimum potential through which an electron would have to fall to ionize an atom, the ionization potential was measured in volts. It is now, however, defined as the energy to effect an ionization and is conveniently measured in electronvolts (although this is not an SI unit) or joules per mole. The synonymous term **ionization energy (IE)** is often used.

The energy to remove the least