

Guide to the

1. Alphabetical order

1.1 Main order of headwords

Alphabetical order is determined on a letter-by-letter basis, not word by word; spaces are disregarded:

acid

acid anhydride

acid–base balance

acid–base catalysis

acid dissociation constant

acid dye

acidemia

1.2 Nonalphabetic characters

Numbers, hyphens, primes, and subscript/superscript text are ignored for the purpose of indexing; an example is the following sequence of entries:

FSH-RH

F1 sphere

F' strain

F-type pentose phosphate pathway

ftz

1.3 Locants and modifiers

In chemical names, any locants and other hyphenated modifiers such as *cis*-, *trans*-, *p*-, and alphabetic Greek characters are not used to determine primary alphabetical order; hence the following entries all appear under the letter A:

***N*-acetylgalactosamine**

***p*-aminobenzoic acid**

***γ*-aminobutyrate shunt**

6-aminohexanoic acid

However, the unhyphenated letters 'c' in 'cDNA' and 'd' in 'dCTP', for example, are treated as integral parts of the word and *are* used to determine alphabetical order.

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1.4 Secondary order involving locants

When such modifiers constitute the only difference between two headwords, they determine the alphabetical order of the entries:

benzodiazepine
***o*-benzoquinone**
***p*-benzoquinone**
benzoyl

encephalitis
3'-end
5'-end
end+

1.5 Format differences in headwords

The order for entries where the headword is identical except for format is

b*, *b*, *b*-, *b*-, -*b*, -*b*, *B*, *B*, *B*-, *B*-, -*B*, -*B

1.6 Subscripts and superscripts

Single letters with subscripts or superscripts are treated as single letters for the purposes of indexing, so entries for ***k*_{cat}** and ***K*_m** will both be found in the list of single-letter entries at the beginning of the letter K. The primary order of these single-letter entries is determined by their format (*see* section 1.5); where there is more than one entry with a given format (e.g. italic, lower case ***k***), these are arranged by alphabetical order of their subscripts/superscripts.

1.7 Greek letters

- Where Greek letters form part of a chemical name, they are not used to determine alphabetical order (*see* section 1.3). Otherwise they are written out in full in the headword, e.g. **nu body**, **beta strand**.
- The names of the letters of the Greek alphabet, together with their English transliterations used in etymologies, are listed in Appendix A. The meanings assigned to Greek alphabetic characters used as symbols are also given in Appendix A.
- Greek characters are set in italic type when the character represents a variable or locant and in roman type when it represents a unit or subtype e.g. of a protein or particle.

2. Format of entries

2.1 Summary of typefaces

- The following distinguishing typefaces are employed in addition to the text light serif typeface used for definitions:

| | |
|------------------------------|--|
| large bold sans serif | headwords |
| text bold serif | alternative terms for and variant spellings of headwords; hidden entries |
| text bold sans serif | cross-references |
| <i>text italic serif</i> | usage notes and field labels; parts of speech; foreign language terms (including scientific and medical Latin); symbols for physical quantities and fundamental physical constants; stereochemical prefixes and alphabetical locants |

2.2 Headwords

- For each entry, the headword is in bold, sans serif type.
- Upper-case (capital) initial letters are used only for proper names (or terms derived from them) and for proprietary names. Abbreviations and symbols are printed in upper and/or lower case as appropriate.
- If a term would normally be set in bold type, this is indicated in the entry:

B *symbol for 1* Napierian absorbance (*see* **absorbance**).
2 magnetic flux density (bold italic).
- Where the same basic term is used in different typefaces, such as roman/italic, or upper case/lower case, or as a prefix or suffix, each usage is given as a separate headword. For example, **h**, ***h***, **H**, and ***H*** each have a separate entry.
- The order in which such entries are given is listed in section 1.5.

2.3 Alternative terms and variant spellings

2.3.1 Choice of headword

Where alternative terms for a headword, or variant spellings of it, exist (*see* section 1.3), the headword selected for the main entry is generally the recommended or preferred term, or the one judged to be the commonest. Exceptions to this generalization are those instances where the name of a Greek alphabetic character is written out for convenience of indexing:

beta globulin or **β globulin**....

2.3.2 General

- Any alternative terms and alternative spellings are listed following the headword in bold, serif type:

retrovirus or **ribodeoxyvirus** or **RNA–DNA virus** any virus belonging to the family Retroviridae....
- Notes regarding the usage of these alternatives may be given in brackets and in italics; for example

DNA glycosylase or (*sometimes*) **DNA glycosidase** any of a group of enzymes....
bacteremia or (*esp. Brit.*) **bacteraemia** the presence of live bacteria in the blood.

bilirubin or (formerly) **bilirubin IX α** the recommended trivial name for the linear tetrapyrrole....

- These alternative terms and spellings also appear as entries in the alphabetical sequence, with a cross-reference to the main entry where the term is defined, unless the variant would appear close to the main entry. Additional information is given where appropriate:

demoxytocin an alternative name for **deaminooxytocin**.

fructose-1,6-diphosphatase a former name for **fructose-bisphosphatase**.

lipide a variant spelling of **lipid**.

molecular exclusion chromatography a less common name for **gel-permeation chromatography**.

oleomargarine an alternative name (esp. US) for **margarine**.

penatin an obsolete name for **glucose oxidase**.

2.3.3 Chemical names

- Synonyms may be given following the headword, in the order: other trivial names (if any); the semi-systematic or semi-trivial name(s); older systematic name in style, if still in widespread use; the systematic name in currently recommended style.
- The headword used to represent a chemical compound that can exist in ionized form(s) is in most cases the name of its physiologically predominant form. So, for example, an entry is headed 'succinate' rather than 'succinic acid'.

2.3.4 Enzyme names

Alternative names may be listed following the headword, which is normally the recommended name; otherwise alternative names include the recommended name (if the headword is the common name), the systematic name, and other names. The EC number is also given.

2.4 Multiple definitions

- Where a term has more than one meaning, the different senses are numbered with bold Arabic numerals.

blockade 1 (in pharmacology) the saturation of a specific type of receptor with an antagonist to its normal agonist. **2** (in immunology) the overloading or saturation of the **reticuloendothelial system** with inert particles, such as carbon particles. **3** to impose any such blockade.

- The order of the numbered entries is generally determined by their biochemical significance.
- The different senses may be further subdivided into def. 1a, def. 1b, etc.

di+ comb. form **1** (in chemical nomenclature) (distinguish from **bis+** (def. 2)) **a** indicating the presence in a molecule of two identical unsubstituted groups, e.g. diethylsulfide, 1,3-dihydroxyacetone. **b** indicating the presence in a molecule of two identical inorganic oxoacid residues in anhydride linkage, e.g. adenosine 5'-diphosphate. **2** or **bis+** (def. 1) denoting two, twofold, twice, doubled.

- Homographs are not distinguished.

2.5 Hidden entries

Hidden entries are terms that are not defined at their normal headword position. Instead, they are treated (implicitly or ex-

plicity) at some other headword. They are set in bold serif type. In the following example, 'bentonite flocculation test' is the hidden entry:

bentonite a colloidal, native hydrated aluminium silicate clay consisting principally of montmorillonite, a complex aluminosilicate, $\text{Al}_2\text{O}_3 \cdot 4\text{SiO}_2 \cdot \text{H}_2\text{O}$, which has marked adsorptive properties. It is used as an inhibitor of nucleases and also in the **bentonite flocculation test**, a passive agglutination test in which antigen-coated bentonite particles are used to detect specific antibody.

2.6 Other information

2.6.1 Plurals

The plural form (or forms) of a headword is (are) given in parenthesis following the headword if its formation is non-standard, e.g. for Latin headwords, or where there is more than one form of the plural.

medulla (*pl. medullas or medullae*) the innermost part of an organ, tissue, or structure; marrow, pith. — **medullary** *adj.*

2.6.2 Affixes and combining forms

- In common with other dictionaries, this Dictionary lists and defines many word elements that are used to compose terms or to modify existing terms. These are either combining forms (which are derived from parent words) or affixes (infixes, prefixes, and suffixes, none of which have parents).
- The usual lexicographical convention is to add a hyphen to suffixes and combining forms when listing them as headwords, although generally the hyphen is omitted in formation of composite terms. However, chemical and biochemical terminology also includes a considerable number of specialized suffixes that retain the hyphen in the formation of composite terms (e.g. 'meso-' in 'meso-cystine'). In order to make an explicit distinction between these alternatives, this Dictionary departs from the common convention by adding a hyphen to an affix in a headword only when a linking hyphen is retained in a combination:

meso- *abbr.: ms-; prefix (in chemical nomenclature) designating a substance whose individual molecules contain....*

By contrast, combining forms (e.g., 'meso' in 'mesoderm') together with affixes producing unhyphenated composite terms, are listed with an added plus sign, placed after and/or before the word-element as appropriate:

meso+ *or (sometimes before a vowel) mes+ comb. form denoting middle, or intermediate.*

+agogue *or (US) +agog suffix denoting an agent that elicits or enhances the secretion of....*

2.6.3 Abbreviations and symbols

- Where a term may be abbreviated or indicated with a symbol, this is noted after the headword.

nuclear magnetic resonance *abbr.: NMR or nmr; the phenomenon that occurs when atomic nuclei....*

electric potential *or potential symbol: V or ϕ ; the work done in bringing unit electric charge....*

- The distinction between an abbreviation and a symbol is a little blurred, since some abbreviations (e.g. lg) also may be

used as symbols. In general, the term 'symbol' is used here for

units and their decimal prefixes (e.g. m, mol; μ , M)

physical quantities and constants (e.g. *a*, *H*; *k*, *R*)

mathematical functions (e.g. exp, ln)

chemical elements (e.g. K, Mg)

groups of letters that can be used in place of a chemical group or compound in an equation or formula (e.g. CoA, Me)

recommended abbreviations for nucleotides, bases, or amino acids.

- The symbols for SI base and derived units and their decimal prefixes are mandatory; all other symbols are recommendations of IUBMB or IUPAC. In conformity with these recommendations, symbols for physical quantities and fundamental physical constants are printed in a sloping (italic) typeface.
- No distinction is made between acronyms, contractions, abbreviations, etc. All are classed as abbreviations. Abbreviations formed from the initial letters of two or more words are printed without periods (full-stops), in line with contemporary practice, but abbreviations that are shortened forms of single words have a terminal period.
- In addition to recommended abbreviations, the Dictionary lists a selection of others commonly encountered in the scientific literature.

2.6.4 Derived terms

Derived terms not meriting separate definition are listed at the end of the entry for the parent term, preceded by a bold em dash and followed by an abbreviation indicating the part of speech.

bactericide or **bacteriocide** any agent (biological, chemical, or physical) that destroys bacteria. —**bactericidal** or **bacteriocidal** *adj.*

2.6.5 Etymology

- Generally, the derivation of words is not explained in entries. The exceptions are for eponymous terms and other entries of particular etymological interest.
- The etymology is given within square brackets at the end of the entry.

ångström or **Ångstrom** *symbol:* Å; a unit of length equal to 10^{-10} metres. ... [After Anders Jonas Ångström (1814–74), Swedish physicist noted for his work on spectroscopy.]

- Greek elements of etymologies are transliterated:

chirality topological handedness: the property of non-identity of an object with its mirror image. ... [From Greek *kheir*, hand.]

2.6.6 Usage

- The field within which the term is used may be specified in italics and in parenthesis before the definition.

malonyl **1** (*in biochemistry*) the univalent acyl group, HOOC–CH₂–CO–, derived from malonic acid by loss of one hydroxyl group. **2** (*in chemistry*) the bivalent acyl

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group, $-\text{CO}-\text{CH}_2-\text{CO}-$, derived from malonic acid by loss of both hydroxyl groups.

- Notes may also be given regarding the use of alternative terms and variant spellings: *see* section 2.3.2.

2.7 Cross-references

2.7.1 Format

- Cross-references are set in bold sans serif type, e.g. **thio-uridine**.
- Where a cross-reference refers to only one sense of a word with multiple definitions, this is indicated as in the following example:

siderophage *an alternative name for siderophore* (def. 1).

2.7.2 Types of cross-reference

- There are cross-references from a variant spelling, or a less commonly used term, etc., to the entry where the term is defined. For examples, *see* section 2.3.2.
- Some cross-references are to related entries giving more information. These may be either embedded in the text:

octulose any **ketose** having a chain of eight carbon atoms in the molecule.

or listed at the end of the entry:

vacuum evaporation a technique for *See also shadow casting*.

- Cross-references may also be used to draw attention to contrasting terms:

heterochromatin ... *Compare euchromatin*.

or to pairs of easily confused terms:

prolidase *another name for X-Pro dipeptidase. Distinguish from prolinase*.

prolinase *the recommended name for Pro-X dipeptidase. Distinguish from prolidase*.

3. Abbreviations

| | |
|--------------------|---|
| <i>abbr.</i> | abbreviation |
| <i>adj.</i> | adjective |
| <i>adv.</i> | adverb |
| <i>Brit.</i> | British |
| <i>comb. form</i> | combining form (<i>see</i> section 2.6.2) |
| <i>3-D</i> | three-dimensional |
| <i>def.</i> | definition |
| <i>e.g.</i> | [Latin, <i>exempli gratia</i>] for example |
| <i>esp.</i> | especially |
| <i>etc.</i> | etcetera |
| <i>Fr.</i> | French |
| <i>i.e.</i> | [Latin, <i>id est</i>] that is |
| <i>max.</i> | maximum |
| <i>n.</i> | noun |
| <i>pl.</i> | plural |
| <i>sing.</i> | singular |
| <i>sp. or spp.</i> | species (singular and plural respectively) |
| <i>US</i> | United States |
| <i>vb.</i> | verb |

Other abbreviations are defined in the text itself.

4. Other conventions

4.1 Spelling and hyphenation

4.1.1 Spelling

- For chemical and biochemical terms, recommended international usage is followed; thus, for example, 'heme' is used rather than 'haem', 'estrogen' rather than 'oestrogen', 'sulfur' rather than 'sulphur', and 'oxytocin' rather than 'ocytocin'. All variants are listed as headwords, however, with cross-references to the corresponding main entries.
- For common terms, e.g. 'colour', British spelling is used.

4.1.2 Hyphenation

- Hyphens are used attributively:
 'T cell' but 'T-cell receptor'
 'amino acid' but 'amino-acid residues'
- This also applies to enzyme names; thus for example, there is no hyphen following the 'glucose' in 'glucose 6-phosphate', but where this substrate forms part of an enzyme name, it is hyphenated, e.g. in 'glucose-6-phosphatase' or 'glucose-6-phosphate isomerase'.

4.2 Nomenclature

In most cases, headwords conform with the recommendations of the various nomenclature bodies of IUBMB and IUPAC (*see* Appendix B for a list of publications dealing with nomenclature rules and recommendations). Other usages are, however, given (*see* Preface). The phrase 'not recommended' has been used to indicate that certain forms are not the recommendation of one of these nomenclature bodies.

4.2.1 Drug names

The recommended international nonproprietary names are used (*International nonproprietary names (INN) for pharmaceutical substances*, World Health Organization, Geneva, 1992); hence, for example, main entries are found under epinephrine and norepinephrine rather than under adrenaline and noradrenaline.

4.2.2 Proprietary names

A few commonly used proprietary names are included; these may be listed at the end of an entry if considered to be of particular interest, especially to non-scientists:

acetaminophen or **paracetamol** ... *Proprietary names:*
Tylenol, Panadol. It inhibits

or may be the main headword (e.g. **Sephadex**).

4.2.3 Other substances

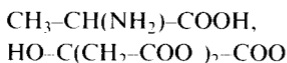
The main entry is under the name used most widely in the scientific literature. Where this is not the recommended name, a cross-reference is given from the recommended name to the main entry. For example, the name 'follicle-stimulating hormone (FSH)' is widely employed instead of the recommended name 'follitropin', hence the former name has been used as the main headword. In such cases there is a cross-reference from the recommended name back to the entry where the substance is defined:

follitropin *the recommended name for follicle-stimulating hormone.*

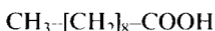
4.3 Representation of chemical structures

4.3.1 Typeset formulae

In conformity with IUPAC nomenclature recommendations for typeset chemical formulae, parentheses (round brackets) indicate a side chain:



and square brackets indicate a condensed chain:



4.3.2 Carbohydrates

- The cyclic forms of monosaccharides are depicted by Haworth representations as are some other compounds; for clarity, the carbon atoms of the heterocyclic ring, and their attached hydrogen atoms, are not shown. *See the **Haworth representation** entry for more detail.*
- Where an abbreviated terminology is included for oligosaccharide chains, the extended or condensed forms described in the recommendations published in *Journal of Biological Chemistry* **257**, 3347–3351 (1982) and reprinted in the 1992 edition of the IUBMB ‘White Book’ (*see Appendix C, item 6*) are variously used.
- Wherever possible, structure diagrams show absolute configurations.

4.4 Periodic table of the elements

The group numbers used in the text are those of the 18-column format of the table given in the 1990 edition of the IUPAC ‘Red Book’ (*see Appendix C, item 4*). The correspondence between this and other versions of the table is described in the **periodic table** entry and shown below the printed table.

4.5 Amino-acid sequences

- For peptide sequences of up to 15 amino-acid residues, the three-letter code is used; longer sequences are given in the one-letter code.
- Motifs are given in the one-letter code.
- The full sequences of many proteins can be found in protein sequence databases, and database codes are given to facilitate access to these. The database codes relate to a number of different databases. The style of the code gives an indication of the database from which the data originate, but if the user does not recognize the code, it is neces-

sary to search for it in a composite database that integrates data from all the major databases. Further information is offered in Appendices D and E.

4.6 Genes

- The accepted format of gene names (i.e., whether lower case or upper case or a mixture) varies between different organisms. Where an entry covers genes from various species, the convention for human genes is generally followed in the headword, i.e. all letters are given in upper case, e.g. '*JUN*'.
- However, when an entry refers only to a gene from a specified organism, the accepted convention for that organism is followed.

4.7 Names of organisms

- Those organisms whose Latin names are used frequently are listed in Appendix H.
- Where a binomial Latin name is repeated within an entry, the genus name is abbreviated after the first occurrence of the name; for example, the full form '*Escherichia coli*' is used when first mentioned in any entry, but subsequent references to this organism in the same entry are abbreviated to '*E. coli*'.

5. Appendices

A number of appendices have been included after the main alphabetical text, as follows:

- Appendix A – The Greek alphabet and Greek characters used as symbols (page 697).
- Appendix B – Nomenclature rules and recommendations (page 701).
- Appendix C – Organizations that are helpful to biochemists and molecular biologists (page 705).
- Appendix D – The Internet (page 709).
- Appendix E – Exploring the language of bioinformatics (page 715).
- Appendix F – Restriction enzymes and methylases (page 725).
- Appendix G – Sequence-rule priorities of some common ligands in molecular entities (page 739).
- Appendix H – Species names (page 740).