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Edited by F. RADT

Series III

CARBOISOCYCLIC CONDENSED COMPOUNDS

Volume 12 B

NAPHTHALENE

A. Compounds Containing One Naphthalene Nucleus

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Hydroxy Compounds

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FOUNDED BY

E. JOSEPHY† AND F. RADT

ELSEVIER'S ENCYCLOPEDIA

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PREFACE TO VOLUME 12

Bicyclic carboisocyclic compounds are dealt with in Volume 12. Owing to the enormous number of compounds with the naphthalene skeleton, the volume is divided into two parts: Vol. 12A includes all bicyclic compounds except those with the naphthalene skeleton, which are contained in Vol. 12B.

Because of post-war difficulties concerning the availability of many original papers, the literature for Vol. 12A could only be compiled up to and including 1941. For Vol. 12B, the first part of which will appear in 1948, the closing date for the inclusion of references is the 31st December 1944. In all cases, publications relating to the structure of compounds are considered right up to the date of printing.

Amsterdam, December, 1947

F. RADT

FROM THE PREFACE TO VOLUME 13

The present volume was almost ready for the press when further work was rendered difficult, if not impossible, by the war and the German occupation of Holland. Before all else, we must place on record here the fate of one of the founders of the Encyclopaedia, Dr. EDITH JOSEPHY, whose faithful devotion to this publication has ended fatally; seized by the Nazis and deported, she shared the fate of the thousands who never returned. The loss of her untiring energy, her vast experience, and her organizing ability could only gradually be compensated for by obtaining new collaborators and by increased efforts of the total editorial staff.

Amsterdam, December, 1946

F. RADT

FROM THE PREFACE TO VOLUME 14

The enormous and increasing output of chemical literature makes it desirable to have a comprehensive account of all the facts known in the field of organic chemistry up to the present, elaborated in such a way that completeness is assured, erroneous data are excluded, and the facts coordinated in a clear and critical way.

The development of our knowledge of the various branches of natural science during the last few decades has taken organic chemistry out of its isolated position and has emphasized the close relationship of organic chemistry particularly to physics and biology.

Organic chemistry has become a sphere of interest not only for those working in pure and applied chemistry but also for physicists and biologists who need the organic compounds for their investigations.

Appreciative of these facts, the Editors planned to arrange the *Encyclopaedia of Organic Chemistry* as a complete survey of all the organic compounds including not only purely chemical but also physical and physiological data.

Bearing in mind that the value of the *Encyclopaedia* to workers in various branches of science will depend largely on the simplicity of the system employed for the arrangement of the compounds, it was decided to use a system based on the structure of the compounds so that compounds which are most closely related are placed together. Within each of the three series (aliphatic, carbocyclic, and heterocyclic) the structural skeleton determines the arrangement. The carbocyclic compounds are divided into compounds with non-condensed and such with condensed rings; the first group is further subdivided according to the number of carbon atoms forming the ring; e.g., compounds with cyclopropane, cyclobutane, cyclo-

pentane, benzene rings, etc. For the condensed polycyclic compounds the natural division is given by the number of the condensed rings leading to classification as bicyclic, tricyclic compounds, etc. In each group with the same number of condensed rings, the compounds with the smallest ring are placed first. In this way the whole chemistry of all the compounds with, for instance, a naphthalene skeleton is to be found in one section. This enables the user to find any compound with the minimum of trouble, especially as the compounds within each section are always arranged in the same order, hydrocarbons, halogen-, nitrogen-, hydroxy-, keto-compounds, carboxylic acids, sulphur compounds, etc.

In connection with each compound its derivatives (additive compounds, esters, ethers, phenylurethan, hydrazones, etc.) are described. It has been our endeavour to keep the system as simple as possible and to avoid separation of compounds which are most closely related chemically. Thus, anhydrides of dicarboxylic acids and lactones of hydroxy acids are dealt with directly after the corresponding acid, exceptions to this arrangement having been made only in cases where these derivatives belong to a very important heterocyclic ring system as, for instance, phthalides.

All the chief systems are introduced by a detailed schematic survey about the various formations of the nucleus concerned and that in the first place about the occurrence in nature and in technical products (coal tar, lignite tar, etc.), next about the syntheses from the systems with less carbon atoms, about the rearrangement from systems with an equal number of carbon atoms, and finally about the degradation from the more complicated systems.

We have intentionally refrained from introducing new systems of nomenclature. In cases where different methods of nomenclature and numbering exist in the literature the method which appears to be the most suitable one has been chosen.

Particular attention was paid to the composition of the index. Each volume contains a subject index as well as a formula index; they contain not only every separate compound described in that volume, but the subject index has also groups of compounds with a similar structural or functional character, e.g. compounds with

acetylene linking, fluoro-, seleno-, metal-, deuterio-compounds, mustard oils, ketenes, etc., hormones, vitamins, etc. The great value of such summaries will only become clear in the general index that will be composed after completion of the whole work, but we beg to draw attention to the keywords "Carcinogenic compounds", "Hormones", "Naturally occurring compounds", "Vitamins and provitamins", which occur in this volume.

All the data from the periodicals listed below have been taken directly from the original papers. For papers from a few journals not listed, Chemical Abstracts and Chemisches Zentralblatt have both been consulted.

The accomplishment of this work was greatly assisted by the kind supply of the rarer periodicals by the following libraries and we wish to express our thanks to the authorities concerned: *Koninklijke Akademie van Wetenschappen*, Amsterdam; *Technische Hoogeschool*, Delft; *Universiteit*, Amsterdam; *Universiteit*, Leiden; *Universiteit*, Utrecht; *Koloniaal Instituut*, Amsterdam; *Laboratoria voor organische*, voor *physiologische*, voor *propaedeutische en anorganische*, voor *analytische Chemie*, voor *Kristallographie en Mineralogie*, voor *Artsenijbereidkunde*, *Physiologisch Laboratorium*, *Pharmacotherapeutisch Laboratorium*, *Histologisch Laboratorium*, *Kanker Instituut* and *Hortus Botanicus*, Amsterdam.

It is a pleasure to acknowledge our indebtedness to many authors who helped us to clear up contradictions in the literature.

Amsterdam, March, 1940

E. JOSEPHY. F. RADT

GENERAL SURVEY

SERIES I. ALIPHATIC COMPOUNDS

- Vol. 1. Hydrocarbons, halogen, and nitrogen compounds
" 2. Hydroxy and keto compounds
" 3. Carboxylic acids, S-, Se-, Te-, P-, As-, and metal compounds

SERIES II. CARBOISOCYCLIC NON-CONDENSED COMPOUNDS

- Vol. 4. Compounds with 3, 4, 5, 7 or more ring-members
" 5-11. Compounds with 6 ring-members

A. MONOCYCLIC SIX-MEMBERED RING COMPOUNDS

- " 5. Hydrocarbons and halogen compounds
" 6. Nitro-, nitroso-, hydroxylamino-, amino-, hydrazino-, diazo-, azo-, azoxy-, triazeno-, triazo-, and other nitrogen compounds
" 7. Hydroxy compounds
" 8. Keto compounds
" 9. Carboxylic acids
" 10. S-, Se-, Te-, P-, As-, and metal compounds

B. POLYCYCLIC NON-CONDENSED SIX-MEMBERED RING COMPOUNDS

- " 11. Biphenyl, diphenylmethane, etc.; terphenyl, triphenylmethane, etc.; compounds with 4 phenyl groups, etc.

SERIES III. CARBOISOCYCLIC CONDENSED COMPOUNDS

- Vol. 12. Bicyclic compounds
" 13. Tricyclic compounds
" 14. Tetra- and higher-cyclic compounds

SERIES IV. HETEROCYCLIC COMPOUNDS

- Vol. 15. Heterocyclic compounds with 1 N
" 16. Heterocyclic compounds with 2 and more N
" 17. Heterocyclic compounds with 1 and more O
" 18. Heterocyclic compounds with N and O; with S, Se, or other elements

GENERAL INDEXES

- Vol. 19. General Subject Index and Group Index
" 20. General Formula Index

GENERAL OUTLINE OF THE PLANNING OF THE ENCYCLOPÆDIA AND INDICATIONS TO FACILITATE ITS USE

Elsevier's Encyclopaedia of Organic Chemistry has been compiled on the basis of the carbon skeleton. Compounds whose carbon-skeleton is broken by other atoms*, e.g., esters, ethers, alkyl-, and acyl-derivatives of amines, hydrazines, etc., are described as derivatives of the corresponding carboxylic acid, hydroxy-, amino-, and hydrazino-compounds, etc., generally under the component which is latest in order of systematic sequence; acetyl-, benzoyl-, phthaloyl-, toluenesulphonyl-, and similar derivatives, however, are dealt with under the corresponding hydroxy- or N-compound. As far as possible, derivatives of any given substance have been grouped together, maintaining at the same time the systematic classification by cross references, or by repetition where necessary. Compounds which contain a six-membered ring as well as one of the rings described in Vol. 4 are dealt with in the latter volume. Thus, for example, phenylcyclopropane will be found with the homologues of cyclopropane in Vol. 4, and not, as a cyclopropyl derivative of benzene, in Vol. 5.

Aliphatic compounds (Vols. 1-3) and compounds with the ring systems described in Vols. 4 and 12-18 have been arranged in the same manner as the compounds with six-membered rings in Vols. 5-10. The polycyclic non-condensed compounds of each ring system are also arranged in the same manner as those of the 6-ring range (see Vol. 11), and immediately follow the respective metal compounds of the ring system in question. Accordingly,

* This does not refer to heterocyclic compounds.

examples for the following general rules can be limited to benzene compounds.

1. Compounds differing only in their degree of saturation are described in immediate succession.
2. Functional groups in the side chain have precedence over similar functional groups in the nucleus; e.g., benzyl alcohol, bis-hydroxymethyl-benzene, etc. precede phenol.
3. Hydrocarbons and compounds having the same functional groups are arranged according to the number of side chains, compounds with one side chain preceding those with two side chains, etc.
4. Compounds containing the same functional group only once are followed by those compounds which, in addition, contain a functional group treated earlier in the system. After these substances are listed the compounds in which the first-named functional group is represented twice. Hence we have the sequence: phenol and its homologues — monohalogenophenols — dihalogenophenols, etc. — nitrophenols — halogenonitrophenols — aminophenols — halogenoaminophenols — nitroaminophenols — halogenonitroaminophenols — hydroxybenzyl alcohol, etc.; dihydroxybenzenes — halogenodihydroxybenzenes, etc. In accordance with this, phenolsulphonic acid will be found in Vol. 10, and not with the hydroxy-compounds in Vol. 7.
5. In the case of tautomers preference has been given to that formulation which most adequately interprets the principal reactions of the compound. In each case, however, a cross reference has been inserted, at that place where the alternate tautomeric form belongs in the system.
6. Anhydrides of dicarboxylic acids should be looked for under the latter, not under the heterocyclic compounds with 1 O. Methylene ethers of dihydroxy-compounds are considered as derivatives of the latter, not as heterocyclic compounds with 2 O; thus, piperonal, for example, will be found in Vol. 8.
7. Natural products whose constitution has not been elucidated completely but whose carbon skeleton is known to some extent are dealt with immediately following all other compounds with

the same skeleton. Other natural products are described in connection with the first product of known composition obtained in their degradation. These natural products which are scattered through the various volumes of the Encyclopaedia are systematically collected in the Group Index in Vol. 19.

The above instructions, if carefully followed, will in every case ensure a quick decision as to the volume in which to look for a particular compound. Once the right volume has been chosen, it is easy to find the compound wanted, either by consultation of the alphabetical index and the formula index at the end of the volume, or with the aid of the table of contents of the volume or of the individual skeleton systems. After the completion of the whole work, every compound described in the literature may be found irrespective of its systematic location by means of the General Subject Index (Vol. 19) and the General Formula Index (Vol. 20).

Finally, the following points should be observed:

a. The year of publication and the name of the first author are given after each item of information; in cases where several statements regarding one compound are taken from the same paper, the reference is given after the last statement. The full references are listed at the end of short sections.

b. The more important systems are preceded by a detailed survey of the various methods of formation of the nucleus concerned. First their occurrence in nature and in technical products (coal tar, lignite tar, etc.) is dealt with. This is followed by syntheses from systems with fewer carbon atoms, and then by methods of formation by degradation of more complicated systems.

TABLE OF ABBREVIATIONS EMPLOYED IN THE TEXT

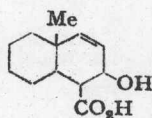
[α]	specific rotation ($[\alpha]_{D}^{20}$, for 20° and sodium light)	ca.	about
abs.	absolute	cal.	calorie(s)
absorpt.	absorption	calcd.	calculated
Ac	acetyl (AcCl, acetyl chloride; Ac ₂ O, acetic anhydride)	c.c.	cubic centimetre(s)
addn.	addition	cf.	compare
alc.	alcohol, alcoholic	cm.	centimetre(s)
alk.	alkaline	coeff.	coefficient
alkali	caustic alkali	compd.	compound
Am	amyl	compn.	composition
amp.	ampere(s)	conc.	concentrated
amt.	amount	concn.	concentration
anh.	anhydrous	cond.	conductivity
approx.	approximate, approximately	condens.	condensation
aq.	aqueous	const.	constant
assoc.	associate(s)	contg.	containing
assocd.	associated	cor.	corrected
assocn.	association	corresp.	corresponding
asym.	asymmetrical	crit.	critical
at.	atom, atomic	cryst.	crystalline, crystals
atm.	atmosphere(s), atmospheric	crystd.	crystallized
Å	Ångström unit(s)	crystn.	crystallization
av.	average	D	Debye unit (10^{-18} e.s.u. $\times$ cm.)
b.	(followed by a figure denoting temperature) boils at, boiling at	d	density (d_4^{13} , specific gravity at 13° referred to water at 4°)
bacteriol.	bacteriological	dec.	decomposed, decomposition
biol.	biological	deriv.	derivative
b.p.	boiling point	det.	determine
Bu	n-butyl	detd.	determined
Bz	benzoyl (BzCl, benzoyl chloride)	detn.	determination
		dextroroty.	dextrorotatory
		diazotd.	diazotized
		diazotn.	diazotization
		dil.	dilute

dild.	diluted	m.	molar
diln.	dilution	M	(with subscript) molecular refraction
dispn.	dispersion	m.	(followed by a figure denoting temperature) melts at, melting at; also metre(s)
dissoc.	dissociate(s)	ma.	milliampere(s)
dissocd.	dissociated	max.	maximum, maxima
dissocn.	dissociation	Me	methyl (MeOH, methanol)
distd.	distilled	meth.	methyl alcoholic
distg.	distilling	mg.	milligram(s)
distn.	distillation	min.	minimum; also minute(s)
elec.	electric, electrical	mixt.	mixture
e.m.f.	electromotive force	ml.	millilitre(s)
equil.	equilibrium	mm.	millimetre(s)
equiv.	equivalent	m μ	10 ⁻⁶ mm. (10 Å)
Et	ethyl (Et ₂ O, ethyl ether)	mmt.	moment
evap.	evaporate	mol.	molecule, molecular, mole
evapd.	evaporated	m.p.	melting point
evapg.	evaporating	mutarotn.	mutarotation
evapn.	evaporation	mv.	millivolt(s)
evoln.	evolution	n	index of refraction (n_D^{20} , for 20° and sodium light)
examn.	examination	N	normal (as applied to concn.)
expt.	experiment	neg.	negative
exptl.	experimental	no.	number
extrd.	extracted	obtd.	obtained
extrg.	extracting	occ.	occurrence
extrn.	extraction	opt. act.	optically active
fluoresc.	fluorescence	org.	organic
fmn.	formation	oxid.	oxidized
f.p.	freezing point	oxidn.	oxidation
fwd.	followed	p.	page
g.	gram(s)	pathol.	pathological
H ₂ SO ₄	conc. sulphuric acid	petrol.ether	petroleum ether
hr.	hour	Ph	phenyl
hydrol.	hydrolysis	pharmacol.	pharmacological
hydrold.	hydrolysed	phys.	physical
inorg.	inorganic	physiol.	physiological
insol.	insoluble	pos.	positive
isold.	isolated	powd.	powdered
isoln.	isolation	pp.	pages
°K.	°Kelvin	ppt.	precipitate
kg.	kilogram(s)	pptd.	precipitated
kg.-cal.	kilogram calorie(s)	pptg.	precipitating
kv.	kilovolt(s)	pptn.	precipitation
kw.	kilowatt(s)		
l.	litre(s)		
laevoroty.	laevorotatory		
lb.	pound(s)		

Pr	propyl	satg.	saturating
prepd.	prepared	satn.	saturation
prepg.	preparing	sec.	second(s), secondary
prepn.	preparation	sepd.	separated
prim.	primary	sepg.	separating
priv. comm.	private communication	sepn.	separation
prod.	product	sol.	soluble
pyr.	pyridine	soln.	solution
qual.	qualitative	soly.	solubility
quant.	quantitative	sp.	specific
rac.	racemic	sp. gr.	specific gravity
recrystd.	recrystallized	spectr.	spectrum
recrystn.	recrystallization	subl.	sublimes
red.	reduced	subln.	sublimation
redn.	reduction	subst.	substance
ref.	references	sym.	symmetrical
resoln.	resolution	synth.	synthesis
resp.	respectively	temp.	temperature
rn.	reaction	tert.	tertiary
rotn.	rotation	unsatd.	unsaturated
roty.	rotatory	v.	volt(s)
sapon.	saponification	vac.	vacuum
sapond.	saponified	vol.	volume
sapong.	saponifying	w.	watt(s)
satd.	saturated	wt.	weight

REPRODUCTION OF STRUCTURAL FORMULAE

In the structural formulae a single line always means a single bond; e.g., the formula



represents

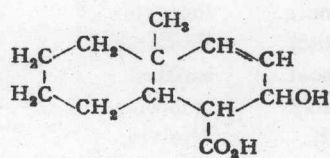


TABLE OF PERIODICALS

ABBREVIATED TITLE	FULL TITLE
<i>Abhandl. deut. Bunsen Ges.</i>	Abhandlungen der deutschen Bunsen-Gesellschaft
<i>Acta Acad. Aboensis, Math. Phys.</i>	Acta Academiae Aboensis, Mathematica et Physica
<i>Acta Brevia Neerland.</i>	Acta Brevia Neerlandica de Physiologia, Pharmacologia, Microbiologia, e.a.
<i>Acta Dermatol.</i>	Acta Dermatologica (Dermatologia, Syphilidologia et Urologia) (Japan)
<i>Acta Forestalia Fennicae</i>	Acta Forestalia Fennicae
<i>Acta Lit. Sci. Univ. Hung. Sect. Chem. Mineral. Phys.</i>	Acta Litterarum ac Scientiarum Regiae Universitatis Hungaricae Francisco-Josephinae. Sectio Chemica, Mineralogica et Physica. Acta Chemica, Mineralogica et Physica
<i>Acta Lit. Sci. Univ. Hung. Sect. Sci. Nat.</i>	Acta Litterarum ac Scientiarum Regiae Universitatis Hungaricae Francisco-Josephinae. Sectio Scientiarum Naturalium
<i>Acta Med. Scand.</i>	Acta Medica Scandinavica
<i>Acta Physicochim. U.R.S.S.</i>	Acta Physicochimica U.R.S.S.
<i>Acta Phys. Polon.</i>	Acta Physica Polonica
<i>Acta Phytochim.</i>	Acta Phytochimica (Japan)
<i>Acta Polon. Pharm.</i>	Acta Poloniae Pharmaceutica
<i>Acta Univ. Latviensis, Kim. Fakult. Serija</i>	Acta Universitatis Latviensis, Kimijas Fakultates Serija
<i>Akust. Z.</i>	Akustische Zeitschrift
<i>Am. Ch. J.</i>	American Chemical Journal
<i>Am. Dyestuff Reprtr.</i>	American Dyestuff Reporter
<i>Am. Gas Assoc., Proc.</i>	American Gas Association, Proceedings of the Annual Convention
<i>Am. Gas J.</i>	American Gas Journal
<i>Am. J. Botany</i>	American Journal of Botany
<i>Am. J. Cancer</i>	The American Journal of Cancer
<i>Am. J. Hyg.</i>	The American Journal of Hygiene
<i>Am. J. Med. Sci.</i>	American Journal of the Medical Sciences
<i>Am. J. Obstet. Gynecol.</i>	American Journal of Obstetrics and Gynecology
<i>Am. J. Pharm.</i>	American Journal of Pharmacy
<i>Am. J. Physiol.</i>	The American Journal of Physiology
<i>Am. J. Sci.</i>	American Journal of Science
<i>Am. Mineralogist</i>	The American Mineralogist
<i>Am. Paint J.</i>	American Paint Journal
<i>Am. Perfumer Essent. Oil Rev.</i>	The American Perfumer and Essential Oil Review
<i>Am. Rev. Tuberc.</i>	The American Review of Tuberculosis
<i>Anales asoc. quim. Argentina</i>	Anales de la asociación química Argentina
<i>Anales fis. quim.</i>	Anales de física y química (Madrid)
<i>Anales soc. cient. argentina</i>	Anales de la sociedad científica argentina
<i>Anales soc. españ. fis. quim.</i>	Anales de la sociedad española de física y química

ABBREVIATED TITLE	FULL TITLE
<i>Analyst</i>	The Analyst
<i>Angew. Ch.</i>	Angewandte Chemie; before 1932 Zeitschrift für angewandte Chemie
<i>Ann.</i>	Annalen der Chemie, Justus Liebig's
<i>Ann. Acad. Sci. Fennicae</i>	Annales Academiae Scientiarum Fennicae
<i>Ann. acad. sci. tech. Varsovie</i>	Annales de l'académie des sciences techniques à Varsovie
<i>Ann. Applied Biol.</i>	The Annals of Applied Biology
<i>Ann. Botany</i>	Annals of Botany
<i>Ann. chim.</i>	Annales de chimie; before 1914 Annales de chimie et de physique
<i>Ann. chim. anal. chim. appl.</i>	Annales de chimie analytique et de chimie appliquée et Revue de chimie analytique réunies
<i>Ann. chim. applicata</i>	Annali di chimica applicata
<i>Ann. combustibles liquides</i>	Annales de l'office national des combustibles liquides
<i>Ann. faculté sci. Marseille</i>	Annales de la faculté des sciences de Marseille
<i>Ann. fals.</i>	Les annales des falsifications et des fraudes
<i>Ann. inst. anal. phys.-chim. (U.S.S.R.)</i>	Annales de l'institut d'analyse physico-chimique (U.S.S.R.)
<i>Ann. inst. Pasteur</i>	Annales de l'institut Pasteur
<i>Ann. jardin bot. Buitenzorg</i>	Annales du Jardin botanique de Buitenzorg
<i>Ann. méd. légale</i>	Annales de médecine légale de criminologie, police scientifique, médecine sociale, et toxicologie
<i>Ann. Philosophy</i>	Annals of Philosophy
<i>Ann. phys.</i>	Annales de physique
<i>Ann. Physik</i>	Annalen der Physik; before 1900 Annalen der Physik und Chemie (Poggendorff; Wiedemann)
<i>Ann. Rept. Agr. and Hort. Research Sta., Long Ashton, Bristol</i>	The Annual Report of the Agricultural and Horticultural Research Station (The National Fruit and Cider Institute), Long Ashton, Bristol
<i>Ann. sci. École normale</i>	Annales scientifiques de l'École Normale Supérieure
<i>Ann. sci. univ. Jassy</i>	Annales scientifiques de l'université de Jassy
<i>Ann. soc. sci. Bruxelles</i>	Annales de la société scientifique de Bruxelles
<i>Ann. Surgery</i>	Annals of Surgery
<i>Ann. univ. Lyon</i>	Annales de l'université de Lyon
<i>Ann. zymol.</i>	Annales de zymologie
<i>Annual Reports</i>	Annual Reports on the Progress of Chemistry, London
<i>Apoth. Ztg.</i>	Apotheker Zeitung
<i>Arb. biol. Reichsanstalt Land- u. Forstw.</i>	Arbeiten aus der biologischen Reichsanstalt für Land- und Forstwirtschaft, Berlin-Dahlem
<i>Arb. kais. Gesundh.</i>	Arbeiten aus dem Kaiserlichen Gesundheitsamte
<i>Arb. Pharm. Inst. Univ. Berlin</i>	Arbeiten aus dem Pharmazeutischen Institut der Universität Berlin
<i>Arb. physiol. u. angew. Entomol.</i>	Arbeiten über physiologische und angewandte Entomologie aus Berlin-Dahlem
<i>Arb. Reichsgesundh. Arbeitsschutz</i>	Arbeiten aus dem Reichsgesundheitsamte Arbeitsschutz, Unfallverhütung, Gewerbehygiene. Sonderausgabe des Reichsarbeitsblattes
<i>Arch. Dermatol. Syphilol.</i>	Archives of Dermatology and Syphilology
<i>Arch. Dermatol. u. Syphilis</i>	Archiv für Dermatologie und Syphilis
<i>Arch. expil. Path. Pharmacol.</i>	Archiv für experimentelle Pathologie und Pharmacologie
<i>Arch. expil. Zellforsch.</i>	Archiv für experimentelle Zellforschung
<i>Arch. farmacol. spen.</i>	Archivio di Farmacologia sperimentale e Scienze affini
<i>Arch. fisiol.</i>	Archivio di fisiologia

ABBREVIATED TITLE	FULL TITLE
<i>Arch. ges. Physiol.</i>	Archiv. für die gesamte Physiologie des Menschen und der Tiere (Pflügers)
<i>Arch. Hyg. Bakt.</i>	Archiv für Hygiene und Bakteriologie
<i>Arch. Internal Med.</i>	The Archives of Internal Medicine
<i>Arch. intern. pharmacodynamie</i>	Archives internationales de pharmacodynamie et de thérapie
<i>Arch. ital. biol.</i>	Archives italiennes de biologie
<i>Arch. Math. Naturvidenskab</i>	Archiv for Matematik og Naturvidenskab
<i>Arch. néerland. physiol.</i>	Archives néerlandaises de physiologie de l'homme et des animaux
<i>Arch. Path.</i>	Archives of Pathology
<i>Arch. Pharm.</i>	Archiv der Pharmazie
<i>Arch. phys. biol.</i>	Archives de physique biologique et de chimie-physique des corps organisés; before 1930 Archives de physique biologique
<i>Arch. Schiffs- u. Tropen-Hyg.</i>	Archiv für Schiffs- und Tropen-Hygiene, Pathologie und Therapie exotischer Krankheiten
<i>Arch. sci. phys. nat.</i>	Archives des sciences physiques et naturelles, Genève
<i>Arch. Surg.</i>	Archives of Surgery
<i>Arch. wiss. u. prakt. Tierheilk.</i>	Archiv für wissenschaftliche und praktische Tierheilkunde
<i>Arhiv Hem. i Farm.</i>	Arhiv za Hemiju i Farmaciju
<i>Arkiv Kemi Mineral. Geol.</i>	Arkiv för Kemi, Mineralogi och Geologi
<i>Asphalt u. Teer, Strassenbautech.</i>	Asphalt und Teer, Strassenbautechnik
<i>Astrophys. J.</i>	The Astrophysical Journal
<i>Atti accad. Italia, Rend.</i>	Atti della reale accademia d'Italia. Rendiconti della classe di scienze fisiche, matematiche e naturali
<i>Atti accad. Lincei</i>	Atti della reale accademia dei Lincei. Rendiconti della classe di scienze fisiche, matematiche e naturali; since 1921 Atti della reale accademia nazionale dei Lincei; since 1946 Atti della accademia nazionale dei Lincei
<i>Atti accad. Lincei, Mem.</i>	Atti della reale accademia dei Lincei. Memorie della classe di scienze fisiche, matematiche e naturali
<i>Atti accad. Torino</i>	Atti della reale accademia delle scienze di Torino
<i>Atti Congr. naz. chim. pura applicata</i>	Atti del congresso nazionale di chimica pura ed applicata
<i>Australian Chem. Inst., J. & Proc.</i>	The Australian Chemical Institute Journal & Proceedings
<i>Australian J. Exptl. Biol. Med. Sci.</i>	The Australian Journal of Experimental Biology and Medical Science
<i>Automobiltech. Z.</i>	Automobiltechnische Zeitschrift
<i>Auto-Tech.</i>	Auto-Technik
<i>Beitr. ch. Physiol. Pathol.</i>	Beiträge zur chemischen Physiologie und Pathologie
<i>Ber.</i>	Berichte der deutschen chemischen Gesellschaft; since 1947 Chemische Berichte
<i>Ber. Afdeel. Handelsmuseum Ver. Kolon. Inst.</i>	Berichten van de Afdeeling Handelsmuseum van de Koninklijke Vereeniging Koloniaal Instituut
<i>Ber. deut. botan. Ges.</i>	Berichte der deutschen botanischen Gesellschaft
<i>Ber. deut. pharm. Ges.</i>	Berichte der deutschen pharmazeutischen Gesellschaft
<i>Ber. Ges. Kohlentechn.</i>	Berichte der Gesellschaft für Kohlentechnik
<i>Ber. ges. Physiol. exptl. Pharmakol.</i>	Berichte über die gesamte Physiologie und experimentelle Pharmakologie
<i>Ber. K. Sächs. Ges. Wiss. Math.-phys. Kl.</i>	Berichte über die Verhandlungen der Königl. Sächsischen Gesellschaft der Wissenschaften zu Leipzig. Mathematisch-physische Klasse

ABBREVIATED TITLE	FULL TITLE
<i>Ber. Schimmel & Co.</i>	Bericht der Schimmel & Co. Aktien-Gesellschaft Miltitz Bz. Leipzig über ätherische Öle, Riechstoffe usw.
<i>Ber. ungar. pharm. Ges.</i>	Berichte der ungarischen pharmazeutischen Gesellschaft
<i>Berlin. klin. Wochschr.</i>	Berliner klinische Wochenschrift
<i>Berlin. tierärztl. Wochschr.</i>	Berliner tierärztliche Wochenschrift
<i>Berlin. u. Münch. tierärztl. Wochschr.</i>	Berliner und Münchener tierärztliche Wochenschrift
<i>Berzelius-Jahresber.</i>	Jahresberichte über die Fortschritte der physischen Wissenschaften 1822-'41, Jahresberichte über die Fortschritte der Chemie 1842-'51 von Jacob Berzelius
<i>Biochem. J.</i>	The Biochemical Journal
<i>Biochem. Z.</i>	Biochemische Zeitschrift
<i>Biol. Bull.</i>	The Biological Bulletin
<i>Biol. Zentr.</i>	Biologisches Zentralblatt
<i>Boll. chim. farm.</i>	Bollettino chimico-farmaceutico
<i>Boll. lega Ital. lotta contro cancro</i>	Bollettino della lega Italiana per la lotta contro il cancro
<i>Boll. soc. adriatica sci. nat. Trieste</i>	Bollettino della società adriatica di scienze naturali in Trieste
<i>Boll. soc. ital. biol. sper.</i>	Bollettino della società italiana di biologia sperimentale
<i>Bot. Ztg.</i>	Botanische Zeitung
<i>Botan. Gaz.</i>	The Botanical Gazette
<i>Braunkohlenarch.</i>	Das Braunkohlenarchiv
<i>Brennstoff-Ch.</i>	Brennstoff-Chemie
<i>Brit. Assoc. Advancement Sci., Rept.</i>	British Association for the Advancement of Science, Report of the Annual Meeting
<i>Brit. J. Exp'l. Path.</i>	The British Journal of Experimental Pathology
<i>Brit. J. Ophthalmol.</i>	The British Journal of Ophthalmology
<i>Brit. Med. J.</i>	The British Medical Journal
<i>Bul. chim. soc. română stiinte</i>	Buletinul de chimie pură si aplicată societatea română de stiinte
<i>Bul. chim. soc. române chim.</i>	Buletinul de chimie pură si aplicată al societății române de chimie
<i>Bul. soc. chim. România</i>	Buletinul societății de chimie din România
<i>Bul. soc. române stiinte</i>	Buletinul societății române de stiinte, Bucuresti-România
<i>Bul. soc. stiinte Bucuresti</i>	Buletinul societății de stiinte din Bucuresti, România
<i>Bul. soc. stiinte Cluj</i>	Buletinul societății de stiinte din Cluj
<i>Bull. acad. imp. sci. St. Pétersbourg</i>	Bulletin de l'académie impériale des sciences de St. Pétersbourg
<i>Bull. acad. méd.</i>	Bulletin de l'académie de médecine
<i>Bull. acad. roy. méd. Belg.</i>	Bulletin de l'académie royale de médecine de Belgique
<i>Bull. acad. roy. sci. Belg.</i>	Bulletins de l'académie royale des sciences, des lettres et des beaux-arts de Belgique
<i>Bull. acad. sci. Russie</i>	Bulletin de l'académie des sciences de Russie
<i>Bull. Acad. Sci. United Provinces Agra Oudh, India</i>	Bulletin of the Academy of Sciences of the United Provinces of Agra and Oudh, Allahabad, India
<i>Bull. acad. sci. U.R.S.S.</i>	Bulletin de l'académie des sciences de l' Union des Républiques Soviétiques Socialistes, Classe des sciences mathématiques et naturelles
<i>Bull. assoc. franç. cancer</i>	Bulletin de l'association française du cancer
<i>Bull. Ch. Soc. Japan</i>	Bulletin of the Chemical Society of Japan