

ELSEVIER'S ENCYCLOPÆDIA

of

ORGANIC CHEMISTRY

Edited by F. RADT

Series III

CARBOISOCYCLIC CONDENSED COMPOUNDS

Volume 14 - Supplement

Pages 1347 s—1868 s

NOR-STERIODS

STERIODS

Hydrocarbons, Halogen, Nitrogen, and Unsubstituted
Monohydroxyl Compounds

Edited by A. GEORG

with the assistance of M. Georg-Plant

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ELSEVIER'S ENCYCLOPEDIA

of

ORGANIC CHEMISTRY

FOUNDED BY

(The late) F. JOSEPH and F. RADT

ELSEVIER'S ENCYCLOPEDIA

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PREFACE

As was pointed out in the preface to the first part of the Supplement to Volume 14, there has been a considerable expansion of the literature concerning poly-isocyclic compounds during the decade 1937-1946 which it covers. The extent of this expansion in the case of the steroids has proved such that their description in a single bound part is not practicable.

The present volume comprises the nor-steroids (compounds related to the steroids, but where one or two of the six-membered rings of the 1.2-cyclopentenophenanthrene ring system have become five-membered), the steroid hydrocarbons, and their halogen, nitrogen, and unsubstituted monohydroxyl derivatives. Subsequent volumes will deal with their substituted monohydroxyl and all polyhydroxyl derivatives, steroid ketones, acids, and sulphur compounds, steroids containing condensed γ - or δ -lactone residues, the sapogenins containing a 1.2-cyclopentenophenanthrene skeleton, compounds containing two 1.2-cyclopentenophenanthrene nuclei (joined by carbon-carbon links), and finally the homo-steroids (compounds in which one or more of the rings of the steroid ring system have undergone expansion). As in the Main Volume, degradation products closely related to the steroids have been described, as they provide fundamental evidence concerning the structure of their precursors and related steroids.

The various nomenclatures and notations encountered in the literature concerning steroids are often very confusing, and the rapid progress made in the stereochemistry of steroids has led to conflicting designation of configurations with its attendant difficulties. Discussion of the treatment of this problem in this Supplement is relegated to the Introduction (p. 1347 s et seq.), where the manner of dealing with the physiology of the steroids is also

considered (p. 1367 s), and where modifications in the sequence of compounds (p. 1369 s), necessitated by the special nature of the steroids, are indicated.

The practice has been continued of including literature references relating to structural changes up to the latest possible date, and those dealing with configuration have also been incorporated. In cases where they are of outstanding importance for the structures or configurations assigned, or where earlier unreliable values might be particularly misleading, certain physical properties have also been quoted from the literature subsequent to 1946. In the light of later publications, certain material available in the literature prior to 1937 has achieved new significance, and has been referred to in this Supplement. As in the case of previous Supplementary Volumes, references to the patent literature have been incorporated.

As in preceding volumes, the interrelationships within certain groups of compounds have been made clear by the provision of reaction schemes, and numerous summaries, including data taken from the Main Volume, are designed to facilitate the comparison of the essential physical properties of isomerides or other closely related compounds. A schematic survey of the occurrence and various methods of formation of the 1,2-cyclopentenophenanthrene nucleus will be given in a later part of this Supplement.

Subject and Formula Indexes cover both the Main and Supplementary Volumes. Page numbers followed by an "s" refer to the Supplement, those without an "s" to the Main Volume.

Finally we wish to offer our thanks to various libraries and institutions for assistance rendered by virtue of facilities accorded or for the loan of books and periodicals, especially to the Koninklijke Akademie van Wetenschappen, Amsterdam, the University of Southern California, Los Angeles, the California Institute of Technology, Pasadena, and the Ecole de Chimie de l'Université, Geneva. We also acknowledge our grateful indebtedness to authors who, by private communications, have helped us to clear up obscurities or contradictions in the literature.

Geneva, October, 1954 A. GEORG

GENERAL SURVEY

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- „ 3. Carboxylic acids, S-, Se-, Te-, P-, As-, and metal compounds

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- „ 5-11. Compounds with 6 ring-members

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- „ 6. Nitro-, nitroso-, hydroxylamino-, amino-, hydrazino-, diazo-, azo-, azoxy-, triazo-, triazeno-, and other nitrogen compounds
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- „ 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 Encyclopædia 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 alternative 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 connexion with the first product of known composition obtained in their degradation. These natural products which are scattered throughout the various volumes of the Encyclopædia 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, then formation by rearrangement of systems with an equal number of carbon atoms, and finally by methods of formation by degradation of more complicated systems.

TABLE OF ABBREVIATIONS EMPLOYED IN THE TEXT

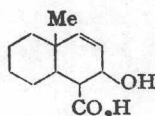
[α]	specific rotation ($[\alpha]_D^{20}$, for 20° and sodium light)	ca.	about
Å	Ångström unit(s)	cal.	calorie(s)
abs.	absolute	calcd.	calculated
absorpt.	absorption	c.c.	cubic centimetre(s)
Ac	acetyl (AcCl, acetyl chloride; Ac ₂ O, acetic anhydride)	cf.	compare
addn.	addition	cm.	centimetre(s)
alc.	alcohol, alcoholic	coeff.	coefficient
alk.	alkaline	compd.	compound
alkali	caustic alkali	compn.	composition
Am	amyl	conc.	concentrated
amp.	ampere(s)	concn.	concentration
amt.	amount	cond.	conductivity
anh.	anhydrous	condens.	condensation
approx.	approximate, approximately	const.	constant
aq.	aqueous	contg.	containing
assoc.	associate(s)	cor.	corrected
assocd.	associated	corresp.	corresponding
assocn.	association	crit.	critical
asym.	asymmetrical	cryst.	crystalline, crystals
at.	atom(s), atomic	crystd.	crystallized
atm.	atmosphere(s), atmospheric	crystn.	crystallization
av.	average	D	Debye unit (10 ⁻¹⁸ e.s.u. × cm.)
b.	(followed by a figure denoting temperature) boils at, boiling at	d	density (d_4^{15} , specific gravity at 15° 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	lb.	pound(s)
diln.	dilution	m.	molar
dispn.	dispersion	M	(with subscript) molecular refraction
dissoc.	dissociate(s)	m.	(followed by a figure denoting temperature) melts at, melting at; also metre(s)
dissocd.	dissociated	ma.	milliampere(s)
dissocn.	dissociation	max.	maximum, maxima
distd.	distilled	Me	methyl (MeOH, methanol)
distg.	distilling	meth.	methyl alcoholic
distn.	distillation	mg.	milligram(s)
elec.	electric, electrical	min.	minimum; also minute(s)
e.m.f.	electromotive force	mixt.	mixture
equil.	equilibrium	ml.	millilitre(s)
equiv.	equivalent	mm.	millimetre(s)
Et	ethyl (Et ₂ O, ethyl ether)	mμ	10 ⁻⁶ mm. (10 Å)
evap.	evaporate	mmt.	moment
evapd.	evaporated	mol.	molecule, molecular, mole
evapg.	evaporating	m.p.	melting point
evapn.	evaporation	mutarotn.	mutarotation
evoln.	evolution	mv.	millivolt(s)
examn.	examination	n	index of refraction (n _D ²⁰ , for 20° and sodium light); also number of molecules in the crystallographic elementary cell
expt.	experiment	N	normal (as applied to concn.)
exptl.	experimental	neg.	negative
extrd.	extracted	No.	number
extrg.	extracting	obtd.	obtained
extrn.	extraction	occ.	occurrence
fluoresc.	fluorescence	opt. act.	optically active
fmn.	formation	org.	organic
f.p.	freezing point	oxid.	oxidized
fwd.	followed	oxidn.	oxidation
g.	gram(s)	p.	page
γ	microgram(s)	Pat.	Patent; see Table of Periodicals under country of issue
H ₂ SO ₄	conc. sulphuric acid	pathol.	pathological
hr.	hour	petrol.ether	petroleum ether
hydrol.	hydrolysis	Ph	phenyl
hydrold.	hydrolysed	pharmacol.	pharmacological
inorg.	inorganic	phys.	physical
insol.	insoluble	physiol.	physiological
isold.	isolated	pos.	positive
isoln.	isolation		
°K.	°Kelvin		
kg.	kilogram(s)		
kg.-cal.	kilogram calorie(s)		
kv.	kilovolt(s)		
kw.	kilowatt(s)		
l.	litre(s)		
lævoroty.	lævorotatory		

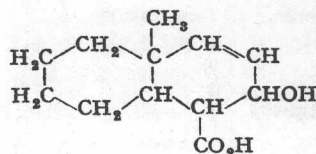
powd.	powdered	sapong.	saponifying
pp.	pages	satd.	saturated
ppt.	precipitate	satg.	saturating
pptd.	precipitated	satn.	saturation
pptg.	precipitating	sec.	second(s), secondary
pptn.	precipitation	sepd.	separated
Pr	propyl	sepg.	separating
prepd.	prepared	sepn.	separation
prepg.	preparing	sol.	soluble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

REPRODUCTION OF STRUCTURAL FORMULÆ

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



represents



For the expression of stereochemical configuration by the use of dotted and wavy lines, see the Introduction, p. 1357 s.

TABLE OF PERIODICALS

ABBREVIATED TITLE

Abhandl. deut. Bunsen Ges.
Acta Acad. Aboensis, Math. Phys.
Acta Brevia Neerland.

Acta Chem. Scand.
Acta Dermatol.

Acta Forestalia Fennicae
Acta Lit. Sci. Univ. Hung.
Sect. Chem. Mineral. Phys.

Acta Lit. Sci. Univ. Hung. Sect.
Sci. Nat.

Acta Med. Scand.
Acta Physicochim. U.R.S.S.
Acta Physiol. Scand.
Acta Phys. Polon.
Acta Phytochim.
Acta Polon. Pharm.
Acta Schol. Med. Univ. Imp.

Kioto

Acta Unio Intern. contra Cancrum
Acta Univ. Latviensis, Kim.
Fakult. Serija

Akust. Z.

Am. Ch. J.

Am. Dyestuff Rept.

Am. Gas Assoc., Proc.

Am. Gas J.

Am. J. Botany

Am. J. Cancer

Am. J. Hyg.

Am. J. Med. Sci.

Am. J. Obstet. Gynecol.

Am. J. Ophthalmol.

Am. J. Path.

Am. J. Pharm.

Am. J. Physiol.

Am. J. Sci.

Am. Mineralogist

Am. Paint J.

FULL TITLE

Abhandlungen der deutschen Bunsen-Gesellschaft
 Acta Academiae Aboensis, Mathematica et Physica
 Acta Brevia Neerlandica de Physiologia, Pharmacologia, Microbiologia, e.a.

Acta Chemica Scandinavica
 Acta Dermatologica (Dermatologia, Syphilidologia et Urologia) (Japan)

Acta Forestalia Fennicae
 Acta Litterarum ac Scientiarum Regiae Universitatis Hungaricae Francisco-Josephinae. Sectio Chemica, Mineralogica et Physica. Acta Chemica, Mineralogica et Physica

Acta Litterarum ac Scientiarum Regiae Universitatis Hungaricae Francisco-Josephinae. Sectio Scientiarum Naturalium

Acta Medica Scandinavica
 Acta Physicochimica U.R.S.S.

Acta Physiologica Scandinavica

Acta Physica Polonica

Acta Phytochimica (Japan)

Acta Poloniae Pharmaceutica

Acta Scholae Medicinalis, Universitatis Imperialis in Kioto

Acta. Unio Internationalis contra Cancrum

Acta Universitatis Latviensis, Kimijas Fakultates Serija

Akustische Zeitschrift

American Chemical Journal

American Dyestuff Reporter

American Gas Association, Proceedings of the Annual Convention

American Gas Journal

American Journal of Botany

The American Journal of Cancer

The American Journal of Hygiene

American Journal of the Medical Sciences

American Journal of Obstetrics and Gynecology

American Journal of Ophthalmology

The American Journal of Pathology

American Journal of Pharmacy

The American Journal of Physiology

American Journal of Science

The American Mineralogist

American Paint Journal

ABBREVIATED TITLE

*Am. Perfumer Essent. Oil Rev.**Am. Rev. Tuberc.**Anal. Chem.**Anales asoc. quim. Argentina**Anales fis. quim.**Anales soc. cient. argentina**Anales soc. españ. fis. quim.**Analyst**Anat. Record**Anesthesiology**Angew. Botan.**Angew. Ch.**Ann.**Ann. Acad. Sci. Fennicae**Ann. acad. sci. tech. Varsovie**Ann. Applied Biol.**Ann. Botany**Ann. chim.**Ann. chim. anal.**Ann. chim. anal. chim. appl.**Ann. chim. applicata**Ann. combustibles liquides**Ann. faculté sci. Marseille**Ann. fals.**Ann. inst. anal. phys.-chim.*

(U.S.S.R.)

*Ann. inst. Pasteur**Ann. Internal Med.**Ann. jardin bot. Buitenzorg**Ann. méd. légale**Ann. méd. (Paris)**Ann. mines & carburants**Ann. N. Y. Acad. Sci.**Ann. Philosophy**Ann. phys.**Ann. Physik**Ann. Rept. Agr. and Hort.**Research Sta., Long Ashton,
Bristol**Ann. Rept., East Malling**Research Sta., Kent**Ann. Rev. Biochem.**Ann. sci. École normale**Ann. sci. univ. Jassy**Ann. soc. sci. Bruxelles**Ann. Surgery*

FULL TITLE

The American Perfumer and Essential Oil Review

The American Review of Tuberculosis

Analytical Chemistry

Anales de la asociación química Argentina

Anales de física y química (Madrid)

Anales de la sociedad científica argentina

Anales de la sociedad española de física y química

The Analyst

The Anatomical Record

Anesthesiology

Angewandte Botanik

Angewandte Chemie; before 1932 Zeitschrift für angewandte Chemie; between 1942 and 1944 incl. Die Chemie

Annalen der Chemie, Justus Liebig's; before 1840 Annalen der Pharmacie; from 1840-1874 (Vol. 172)

Annalen der Chemie und Pharmacie

Annales Academiae Scientiarum Fennicae

Annales de l'académie des sciences techniques à Varsovie

The Annals of Applied Biology

Annals of Botany

Annales de chimie; before 1914 Annales de chimie et de physique

Annales chimie analytique

Annales de chimie analytique et de chimie appliquée et Revue de chimie analytique réunies

Annali di chimica applicata

Annales de l'office national des combustibles liquides

Annales de la faculté des sciences de Marseille

Les annales des falsifications et des fraudes

Annales de l'institut d'analyse physico-chimique (U.S.S.R.)

Annales de l'institut Pasteur

Annals of Internal Medicine

Annales du Jardin botanique de Buitenzorg

Annales de médecine légale de criminologie, police scientifique, médecine sociale, et toxicologie

Annales de médecine (Paris)

Annales des mines & carburants

Annals of the New York Academy of Sciences

Annals of Philosophy

Annales de physique

Annalen der Physik; before 1900 Annalen der Physik und Chemie (Poggendorff; Wiedemann)

The Annual Report of the Agricultural and Horticultural Research Station (The National Fruit and Cider Institute), Long Ashton, Bristol

Annual Report, East Malling Research Station, near Maidstone, Kent

Annual Review of Biochemistry

Annales scientifiques de l'École Normale Supérieure

Annales scientifiques de l'université de Jassy

Annales de la société scientifique de Bruxelles

Annals of Surgery

ABBREVIATED TITLE	FULL TITLE
<i>Ann. Trop. Med. Parasitol.</i>	Annals of Tropical Medicine and Parasitology
<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. Anat. Physiol. u. wiss. Med.</i>	Archiv für Anatomie, Physiologie und wissenschaftliche Medizin
<i>Arch. belges dermatol. et syphiligr.</i>	Archives belges de dermatologie et de syphiligraphie
<i>Arch. Biochem.</i>	Archives of Biochemistry
<i>Arch. Biol. Hung.</i>	Archiva Biologica Hungarica
<i>Arch. Chem. i Farm.</i>	Archiwum Chemji i Farmacji (Warsaw)
<i>Arch. Dermatol. Syphilol.</i>	Archives of Dermatology and Syphilology
<i>Arch. Dermatol. u. Syphilis</i>	Archiv für Dermatologie und Syphilis
<i>Arch. expit. Path. Pharmacol.</i>	Archiv für experimentelle Pathologie und Pharmakologie
<i>Arch. expit. Zellforsch.</i>	Archiv für experimentelle Zellforschung
<i>Arch. farmacol. sper.</i>	Archivio di Farmacologia sperimentale e Scienze affini
<i>Arch. farm. y bioquím. Tucumán</i>	Archivos de farmacia y bioquímica de Tucumán
<i>Arch. fisiol.</i>	Archivio di fisiologia
<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. intern. physiol.</i>	Archives internationales de physiologie
<i>Arch. ital. biol.</i>	Archives italiennes de biologie
<i>Arch. Math. Naturvidenskab</i>	Archiv for Mathematik og Naturvidenskab
<i>Arch. néerland. physiol.</i>	Archives néerlandaises de physiologie de l'homme et des animaux
<i>Arch. Ophthalmol. (Chicago)</i>	Archives of Ophthalmology (Chicago)
<i>Arch. Path.</i>	Archives of Pathology
<i>Arch. Pharm.</i>	Archiv der Pharmazie; before 1832 Archiv des Apotheker-Vereins im nördlichen Teutschland
<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.</i>	Archives des sciences, Genève; before 1948 Archives des sciences physiques et naturelles, Genève
<i>Arch. sci. biol. (U.S.S.R.)</i>	Archives des sciences biologiques (U.S.S.R.)
<i>Arch. sci. phys. nat.</i>	Archives des sciences physiques et naturelles, Genève
<i>Arch. Surg.</i>	Archives of Surgery

ABBREVIATED TITLE	FULL TITLE
<i>Arch. wiss. u. prakt. Tierheilh.</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>Arkiv Zool.</i>	Arkiv för Zoologi, utgivet av K. Svenska Vetenskapsakademien
<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. Lincei, Transunti</i>	Atti della reale accademia dei Lincei. Transunti
<i>Atti accad. Torino</i>	Atti della reale accademia delle scienze di Torino
<i>Atti congr. intern. chim.</i>	Atti del congresso internazionale di chimica
<i>Atti congr. naz. chim. pura applicata</i>	Atti del congresso nazionale di chimica pura ed applicata
<i>Atti ist. veneto sci. lettere ed art.</i>	Atti del (reale) istituto veneto di scienze, lettere ed arti
<i>Atti soc. nat. e mat. Modena</i>	Atti della società dei naturalisti e matematici di Modena
<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>Australian Pat.</i>	Australian Patent
<i>Austrian Pat.</i>	Austrian Patent
<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>Beitr. pathol. Anat. u. allgem. Pathol.</i>	Beiträge zur pathologischen Anatomie und zur allgemeinen Pathologie
<i>Belg. Pat.</i>	Belgian Patent
<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. Kohlentech.</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; since 1919 Berichte über die Verhandlungen der Sächsischen Akademie der Wissenschaften zu Leipzig, Mathematisch-physische Klasse
<i>Ber. Schimmel & Co.</i>	Bericht der Schimmel & Co. Aktien-Gesellschaft Miltitz Bz. Leipzig über ätherische Öle, Riechstoffe usw.

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<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>Biochim. Biophys. Acta</i>	Biochimica et Biophysica Acta
<i>Biochim. e terap. sper.</i>	Biochimica e terapia sperimentale
<i>Biokhimiya</i>	Biokhimiya
<i>Biol. Bull.</i>	The Biological Bulletin
<i>Biol. Revs. Cambridge Phil. Soc.</i>	Biological Reviews of the Cambridge Philosophical Society
<i>Biol. Zentr.</i>	Biologisches Zentralblatt
<i>BIOS Final Report</i>	Report prepared by British Intelligence Objectives Sub-committee
<i>Boissiera</i>	Boissiera (Geneva)
<i>Bol. inst. med. exptl. estud. cáncer (Buenos Aires)</i>	Boletín del instituto de medicina experimental para el estudio y tratamiento del cáncer (Buenos Aires)
<i>Boll. chim. farm.</i>	Bollettino chimico-farmaceutico
<i>Boll. ist. sieroterap. milan.</i>	Bollettino dell'istituto sieroterapico milanese
<i>Boll. lega Ital. lotta contro cancro</i>	Bollettino della lega Italiana per la lotta contro il cancro
<i>Boll. sci. fac. chim. ind. Bologna</i>	Bollettino scientifico della facoltà di chimica industriale di Bologna
<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. Dermatol. Syphilis</i>	The British Journal of Dermatology and Syphilis
<i>Brit. J. Exptl. Path.</i>	The British Journal of Experimental Pathology
<i>Brit. J. Ind. Med.</i>	British Journal of Industrial Medicine
<i>Brit. J. Ophthalmol.</i>	The British Journal of Ophthalmology
<i>Brit. Med. J.</i>	The British Medical Journal
<i>Brit. Pat.</i>	British Patent
<i>Bul. chim. soc. romând științe</i>	Buletinul de chimie pură și aplicată societatea română de științe
<i>Bul. chim. soc. române chim.</i>	Buletinul de chimie pură și aplicată al societății române de chimie
<i>Bul. soc. chim. România</i>	Buletinul societății de chimie din România
<i>Bul. soc. române științe</i>	Buletinul societății române de științe, București-România
<i>Bul. soc. științe București</i>	Buletinul societății de științe din București, România
<i>Bul. soc. științe Cluj</i>	Buletinul societății de științe 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

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<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. Agr. Ch. Soc. Japan</i>	Bulletin of the Agricultural Chemical Society of Japan
<i>Bull. assoc. franç. étude cancer</i>	Bulletin de l'association française pour l'étude du cancer
<i>Bull. biol. méd. expil. U.R.S.S.</i>	Bulletin de biologie et de médecine expérimentale de l'U. R. S. S.
<i>Bull. Ch. Soc. Japan</i>	Bulletin of the Chemical Society of Japan
<i>Bull. classe sci., Acad. roy. Belg.</i>	Bulletin de la classe des sciences, Académie royale de Belgique (Mededeelingen van de Klasse der Wetenschappen, Koninklijke Belgische Academie)
<i>Bull. Imp. Inst.</i>	Bulletin of the Imperial Institute
<i>Bull. inst. océanog.</i>	Bulletin de l'institut océanographique
<i>Bull. Inst. Phys. Ch. Research</i>	Bulletin of the Institute of Physical and Chemical Research (Tokyo)
<i>Bull. inst. pin</i>	Bulletin de l'institut du pin
<i>Bull. inst. recherches biol. Perm</i>	Bulletin de l'institut des recherches biologiques de Perm
<i>Bull. intern. acad. polon.</i>	Bulletin international de l'académie polonaise des sciences et des lettres, Classe des sciences mathématiques et naturelles; before 1919 Bulletin international de l'académie des sciences de Cracovie
<i>Bull. Jardin bot. Buitenzorg</i>	Bulletin du Jardin botanique de Buitenzorg
<i>Bull. Johns Hopkins Hosp.</i>	Bulletin of the Johns Hopkins Hospital
<i>Bull. mat. grasses</i>	Bulletin des matières grasses de l'institut colonial de Marseille
<i>Bull. sci. acad. roy. Belg.</i>	Bulletin de la classe des sciences, académie royale de Belgique
<i>Bull. sci. école polytech. Timisoara</i>	Bulletin scientifique de l'école polytechnique de Timisoara
<i>Bull. sci. ind. Roure-Bertrand fils</i>	see <i>Recherches Roure-Bertrand fils</i>
<i>Bull. sci. pharmacol.</i>	Bulletin des sciences pharmacologiques
<i>Bull. sect. sci. acad. roumaine</i>	Bulletin de la section scientifique de l'académie roumaine
<i>Bull. soc. chim.</i>	Bulletin de la société chimique de France
<i>Bull. soc. chim. Belg.</i>	Bulletin de la société chimique de Belgique et Recueil des travaux chimiques belges
<i>Bull. soc. chim. biol.</i>	Bulletin de la société de chimie biologique
<i>Bull. soc. franç. minéral.</i>	Bulletin de la société française de minéralogie
<i>Bull. soc. ind. Mulhouse</i>	Bulletin de la société industrielle de Mulhouse
<i>Bull. soc. minéral. France</i>	Bulletin de la société minéralogique de France
<i>Bull. soc. naturalistes Moscou</i>	Bulletin de la société des naturalistes de Moscou
<i>Bull. soc. pharm. Bordeaux</i>	Bulletin des travaux de la société de pharmacie de Bordeaux
<i>Bull. soc. roumaine phys.</i>	Bulletin de la société roumaine de physique
<i>Bull. soc. sci. Bretagne</i>	Bulletin de la société scientifique de Bretagne. Sciences mathématiques, physiques, et naturelles
<i>Bull. soc. sci. Bucarest</i>	Bulletin de la société des sciences de Bucarest-Roumanie