NSRDS—NBS 43, Supplement

U.S. DEPARTMENT OF COMMERCE / National Bureau of Standards

Selected Specific Rates of Reactions of Transients from Water in Aqueous Solution.

Hydrated Electron, Supplemental Data

NATIONAL BUREAU OF STANDARDS

The National Bureau of Standards[1] was established by an act of Congress March 3, 1901. The Bureau's overall goal is to strengthen and advance the Nation's science and technology and facilitate their effective application for public benefit. To this end, the Bureau conducts research and provides: (1) a basis for the Nation's physical measurement system, (2) scientific and technological services for industry and government, (3) a technical basis for equity in trade, and (4) technical services to promote public safety. The Bureau consists of the Institute for Basic Standards, the Institute for Materials Research, the Institute for Applied Technology, the Institute for Computer Sciences and Technology, and the Office for Information Programs.

THE INSTITUTE FOR BASIC STANDARDS provides the central basis within the United States of a complete and consistent system of physical measurement; coordinates that system with measurement systems of other nations; and furnishes essential services leading to accurate and uniform physical measurements throughout the Nation's scientific community, industry, and commerce. The Institute consists of a Center for Radiation Research, an Office of Measurement Services and the following divisions:

Applied Mathematics — Electricity — Mechanics — Heat — Optical Physics — Nuclear Sciences[2] — Applied Radiation[2] — Quantum Electronics[3] — Electromagnetics[3] — Time and Frequency[3] — Laboratory Astrophysics[3] — Cryogenics[3].

THE INSTITUTE FOR MATERIALS RESEARCH conducts materials research leading to improved methods of measurement, standards, and data on the properties of well-characterized materials needed by industry, commerce, educational institutions, and Government; provides advisory and research services to other Government agencies; and develops, produces, and distributes standard reference materials. The Institute consists of the Office of Standard Reference Materials and the following divisions:

Analytical Chemistry — Polymers — Metallurgy — Inorganic Materials — Reactor Radiation — Physical Chemistry.

THE INSTITUTE FOR APPLIED TECHNOLOGY provides technical services to promote the use of available technology and to facilitate technological innovation in industry and Government; cooperates with public and private organizations leading to the development of technological standards (including mandatory safety standards), codes and methods of test; and provides technical advice and services to Government agencies upon request. The Institute consists of a Center for Building Technology and the following divisions and offices:

Engineering and Product Standards — Weights and Measures — Invention and Innovation — Product Evaluation Technology — Electronic Technology — Technical Analysis — Measurement Engineering — Structures, Materials, and Life Safety[4] — Building Environment[4] — Technical Evaluation and Application[4] — Fire Technology.

THE INSTITUTE FOR COMPUTER SCIENCES AND TECHNOLOGY conducts research and provides technical services designed to aid Government agencies in improving cost effectiveness in the conduct of their programs through the selection, acquisition, and effective utilization of automatic data processing equipment; and serves as the principal focus within the executive branch for the development of Federal standards for automatic data processing equipment, techniques, and computer languages. The Institute consists of the following divisions:

Computer Services — Systems and Software — Computer Systems Engineering — Information Technology.

THE OFFICE FOR INFORMATION PROGRAMS promotes optimum dissemination and accessibility of scientific information generated within NBS and other agencies of the Federal Government; promotes the development of the National Standard Reference Data System and a system of information analysis centers dealing with the broader aspects of the National Measurement System; provides appropriate services to ensure that the NBS staff has optimum accessibility to the scientific information of the world. The Office consists of the following organizational units:

Office of Standard Reference Data — Office of Information Activities — Office of Technical Publications — Library — Office of International Relations.

---

[1] Headquarters and Laboratories at Gaithersburg, Maryland, unless otherwise noted; mailing address Washington, D.C. 20234.
[2] Part of the Center for Radiation Research.
[3] Located at Boulder, Colorado 80302.
[4] Part of the Center for Building Technology.

Selected Specific Rates of Reactions of Transients from Water in Aqueous Solution. Hydrated Electron, Supplemental Data

Alberta B. Ross

Radiation Chemistry Data Center
University of Notre Dame
Notre Dame, Indiana 46556

U.S. DEPARTMENT OF COMMERCE, Rogers C. B. Morton, *Secretary*

U.S. NATIONAL BUREAU OF STANDARDS, Richard W. Roberts, *Director*

Issued June 1975

Library of Congress Catalog Card Number: 72-600064

NSRDS-NBS 43, Supplement

Nat. Stand. Ref. Data Ser., Nat. Bur. Stand. (U.S.), 43, Suppl. 43 pages (June 1975)

CODEN: NSRDAP

U.S. GOVERNMENT PRINTING OFFICE
WASHINGTON: 1975

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402
(Order by SD Catalog No. C13.48:43, Suppl.). Price cents. (Add 25 percent additional for other than U.S. mailing.)

$1.10

Foreword

The National Standard Reference Data System provides access to the quantitative data of physical science, critically evaluated and compiled for convenience and readily accessible through a variety of distribution channels. The System was established in 1963 by action of the President's Office of Science and Technology and the Federal Council for Science and Technology, and responsibility to administer it was assigned to the National Bureau of Standards.

NSRDS receives advice and planning assistance from a Review Committee of the National Research Council of the National Academy of Sciences-National Academy of Engineering. A number of Advisory Panels, each concerned with a single technical area, meet regularly to examine major portions of the program, assign relative priorities, and identify specific key problems in need of further attention. For selected specific topics, the Advisory Panels sponsor subpanels which make detailed studies of users' needs, the present state of knowledge, and existing data resources as a basis for recommending one or more data compilation activities. This assembly of advisory services contributes greatly to the guidance of NSRDS activities.

The System now includes a complex of data centers and other activities in academic institutions and other laboratories. Components of the NSRDS produce compilations of critically evaluated data, reviews of the state of quantitative knowledge in specialized areas, and computations of useful functions derived from standard reference data. The centers and projects also establish criteria for evaluation and compilation of data and recommend improvements in experimental techniques. They are normally associated with research in the relevant field.

The technical scope of NSRDS is indicated by the categories of projects active or being planned: nuclear properties, atomic and molecular properties, solid state properties, thermodynamic and transport properties, chemical kinetics, and colloid and surface properties.

Reliable data on the properties of matter and materials is a major foundation of scientific and technical progress. Such important activities as basic scientific research, industrial quality control, development of new materials for building and other technologies, measuring and correcting environmental pollution depend on quality reference data. In NSRDS, the Bureau's responsibility to support American science, industry, and commerce is vitally fulfilled.

RICHARD W. ROBERTS, *Director*

Preface

This report is one of a series of data publications on radiation chemistry; the aim of the series is to compile, evaluate, and present the numerical results on processes occurring in systems which have been subjected to ionizing radiation. Various kinds of data are important in radiation chemistry. The quantities which were measured first were the observed radiation yields or G values (molecules formed or destroyed per 100 eV). Various indirect methods based on G values have been used to determine yields of transient species and relative rates of reactions. The spectral properties (optical, electron spin resonance) of transients have provided a direct method for their identification, and rates of the very fast reactions of transients which occur in irradiated systems have been measured directly by spectroscopic methods. Conductivity and luminescence methods have also provided a means of measuring properties of transients and their kinetics. Some reactions which occur in irradiated systems have also been studied by other methods, such as photochemistry, electric discharge, ultrasonics, chemical initiation, electron impact, etc. The emphasis in these publications is on the data of radiation chemistry, but where other pertinent data exist, they are included.

The data of radiation chemistry are voluminous; thousands of systems have been investigated. As a result there are certain collections, *e.g.* rate constants of particular types of reactions or certain properties of transients, for which tabulations of the data are considered essential, but for which critical assessment of each value is impossible. On the other hand, certain systems and properties have been studied so extensively that critical examination of these data is desirable and timely. Authors of this series of data publications have been asked to evaluate the extent to which the data can be critically assessed, to describe their criteria for evaluation, and to designate preferred values whenever possible.

Contents

Selected Specific Rates of Reactions of Transients from Water in Aqueous Solution. Hydrated Electron, Supplemental Data.

Alberta B. Ross

*Radiation Chemistry Data Center, Radiation Laboratory**

University of Notre Dame, Notre Dame, Ind. 46556

A compilation of rates of reactions of hydrated electrons with other transients and with organic and inorganic solutes in aqueous solution appeared in NSRDS–NBS 43, and covered the literature up to early 1971. This supplement includes additional rates which have been published through July 1973.

Keywords: Aqueous solution; chemical kinetics; data compilation; hydrated electron; radiation chemistry; rates.

Introduction

When the preparation of NSRDS–NBS 43 (73–0030) was completed two and one half years ago, rates of nearly 700 reactions of the hydrated electron with various organic and inorganic ions and molecules in aqueous solution had been collected. Since that time rates of about 300 additional reactions have been reported in the literature bringing the total number of hydrated electron reactions which have been studied quantitatively to nearly one thousand. This supplement includes all of the data on reactions not previously reported as well as new rate determinations for reactions included in the earlier compilation.

The selection criteria and arrangement of the tables are similar to those used in the earlier work. Each reaction is numbered and the numbers in this supplement are prefixed by an S. A correlation between the reaction numbers in the main work and in the supplement is included at the end of this section. Reactions of the hydrated electron with transient ions and radicals derived from water are included in table 1. Reactions of e^-_{aq} with inorganic ions and molecules in table 2 are listed alphabetically by main element, and reactions of e^-_{aq} with organic ions and molecules in table 3 are listed alphabetically by name. A formula index follows the tables and refers to reactants listed in both this supplement and the main work, NSRDS–NBS 43.

The rates listed, in most cases, are observed values. In some cases, however, rates for the individual ionic forms of compounds which have acid–base equilibria have been calculated by the author of the original paper and are reported along with the observed rates at varying pH. Usually, however, the rates are listed under the uncharged parent compound, along with any available information on pH and pK. The equation for the reaction has been included only when evidence for product determination has been reported.

*The Radiation Laboratory is operated under contract with The Atomic Energy Commission. The work of the Center is supported jointly by The National Bureau of Standards, Office of Standard Reference Data and The Atomic Energy Commission. This AEC Document COO–38–905.

In most of the studies cited the hydrated electron has been generated by pulse radiolysis and the specific rate, k, has been determined by measuring the rate of decay of the optical absorption of the hydrated electron in a solution of 10^{-3} mol/dm^3 or less of reactant. When a correction was made for ionic strength effect, the rate is marked (cor.). In some cases ratios of rates have been determined by competition kinetics and they are listed in the column under *Ratio* in the form k/k_X; $k_X = k(e^-_{aq} + X)$ where X is the competing reactant. The relative rate, k, obtained in this way using the assumed value of k_X given under *Comments*, is listed under the k column and marked (rel.). The assumed values of k_X are the same as those used in the main work, NSRDS–NBS 43, except where noted in these tables. Abbreviations used throughout the tables are listed at the end of this section.

It is expected that data will continue to appear and that further supplements to these tables will be prepared. If any data which have already been published have been omitted, the author would be very grateful to know of those omissions.

Abbreviations and Symbols

A	frequency factor	G	radiation yield (molecules or ions per 100 eV absorbed)
abs.	absorption		
alk.	alkaline	γ–r.	gamma–radiolysis
bipy	2,2′–bipyridine	k	specific rate
BrPhOH	bromophenol	μ	ionic strength
calcd.	calculated	M	mol/dm^3
chem.	chemical	mol. wt.	molecular weight
c.k.	competition kinetics	obs.	observed
concn.	concentration	opt.	optical spectroscopy
condy.	conductivity	oxy	oxygen
cor.	corrected	pol.	polarography
d.k.	decay kinetics	p.b.k.	product buildup kinetics
ϵ	extinction coefficient	p.r.	pulse radiolysis
E_a	activation energy	rel.	relative
estd.	estimated	satd.	saturated
formn.	formation	soln.	solution
f. phot.	flash photolysis	terpy	2,2′,6′,2″–terpyridine

Correlation of Reaction Numbers in NSRDS–NBS 43 and this Supplement

Consecutive numbers were assigned to the reactions listed in both NSRDS–NBS 43 and the Supplement. The reactions in the original work for which additional data are available in this supplement are listed below along with the corresponding reaction number in this supplement.

NSRDS–NBS 43	Supplement	NSRDS–NBS 43	Supplement	NSRDS–NBS 43	Supplement
1.3	S1.1	1.115	S1.25	1.188	S1.43
1.4	S1.2	1.127	S1.26	1.189	S1.44
1.5	S1.3	1.137	S1.30	1.193	S1.45
1.6	S1.4	1.143	S1.31	1.205	S1.47
1.9	S1.5	1.146	S1.32	1.211	S1.48
1.37	S1.9	1.156	S1.35	1.213	S1.50a
1.38	S1.10	1.165	S1.36	1.223	S1.51
1.54	S1.11	1.179	S1.38	1.225	S1.52
1.55	S1.13	1.180	S1.39	1.226	S1.53
1.59	S1.14	1.181	S1.40	1.231a	S1.55
1.76	S1.15	1.182	S1.41	1.233	S1.57
1.78	S1.19	1.186	S1.42	1.236	S1.61

Correlation of Reaction Numbers—Continued

NSRDS–NBS 43	Supplement	NSRDS–NBS 43	Supplement	NSRDS–NBS 43	Supplement
1.237	S1.62	1.367a	S1.174	1.513	S1.301
1.238	S1.63	1.388	S1.192	1.514	S1.304
1.240	S1.65	1.389	S1.193	1.517	S1.365
1.242	S1.68	1.390–2	S1.194	1.518	S1.309
1.250	S1.71	1.393	S1.196	1.522	S1.314
1.265	S1.72	1.394	S1.197	1.523	S1.318
1.272	S1.73	1.395	S1.199	1.530	S1.323
1.274	S1.74	1.395a	S1.203	1.532	S1.327
1.286	S1.75	1.396	S1.204	1.551	S1.341
1.287	S1.77	1.403	S1.218	1.553	S1.348
1.288	S1.78	1.405	S1.227	1.554	S1.349
1.289	S1.80	1.409a	S1.231	1.559	S1.352
1.291	S1.81	1.409b	S1.232	1.568	S1.358
1.296	S1.87	1.417	S1.237	1.572	S1.359
1.298a	S1.98	1.421a	S1.239	1.573	S1.361
1.299	S1.99	1.422	S1.242	1.573a	S1.367
1.300	S1.105	1.425	S1.243	1.575	S1.369
1.301	S1.108	1.433	S1.245	1.576	S1.370
1.302	S1.109	1.435	S1.246	1.577	S1.372
1.303–4	S1.110	1.437a	S1.251	1.578	S1.374
1.305	S1.111	1.439a	S1.252	1.592	S1.385
1.310	S1.116	1.441	S1.254	1.593a	S1.388
1.313b	S1.121	1.442	S1.255	1.595	S1.389
1.314	S1.123	1.443	S1.256	1.596	S1.391
1.321–2	S1.128	1.444	S1.257	1.604	S1.393
1.323	S1.131	1.445	S1.258	1.613–4	S1.401
1.324	S1.132	1.451	S1.261	1.615	S1.403
1.325	S1.133	1.452	S1.262	1.615b	S1.405
1.327a	S1.135	1.454	S1.266	1.616	S1.406
1.329	S1.137	1.455	S1.267	1.616a	S1.407
1.330	S1.138	1.458	S1.270	1.621	S1.416
1.331	S1.144	1.465a	S1.278	1.627	S1.418
1.332	S1.146	1.465c	S1.279	1.632	S1.420
1.343	S1.157	1.481	S1.287	1.633b	S1.411
1.344	S1.158	1.483a	S1.382	1.643	S1.434
1.348	S1.159	1.487	S1.289	1.645–6	S1.436
1.354	S1.164	1.501	S1.296	1.647–8	S1.437
1.356	S1.166	1.507	S1.298	1.649	S1.438
1.366	S1.173	1.511–2	S1.299		

TABLE 1. *Reactions of hydrated electrons with transients from water*

No.	Solute and Reaction	pH	k(dm^{3}mol^{-1}s^{-1})	Ratio	Source	Method	Comment	Ref.
S1.1	e^-_{aq} $e^-_{aq} + e^-_{aq} \rightarrow H_2 + 2OH^-$	alk.	$(5.8 \pm 0.2) \times 10^9$ [a]	—	f.phot.	opt.	d.k.; H_2–satd.; ϵ = 10,900 dm^{3}mol^{-1}cm^{-1} at 578 nm.	69–7106
		7–14	—	$k_H/k_D = 6.0 \pm 0.1$	p.r.	chem.	obs. H_2, D_2 and HD yields in H_2O – D_2O; dose rate 10^{26}–10^{28}eV/g·s.	72–0013
		alk.	~(1.5 to 2) x 10^9	—	p.r.	opt.	d.k.; 6*M* NaOH; $\epsilon = 1.6 \times 10^4$ dm^{3}mol^{-1}cm^{-1} at 600 nm.	72–0437
		~ 11	$(2.5 \pm 0.1) \times 10^9$	—	f.phot.	opt.	d.k.; H_2–satd.	72–7158
		See also 1.3.						
S1.2	e^-_d	*See* S1.1; *see also* 1.4.						
S1.3	H $e^-_{aq} + H \rightarrow H_2 + OH^-$	7–14	—	$k_H/k_D = 1.3 \pm 0.2$	p.r.	chem.	see comment under S1.1.	72–0013
		See also 1.5.						
S1.4	D $e^-_d + D \rightarrow D_2 + OD^-$	*See* S1.3; *See also* 1.6.						
S1.5	O^- $e^-_{aq} + O^- \rightarrow O^{2-}$	alk.	~ 1.2 x 10^{10}		p.r.	opt.	d.k.; 6*M* NaOH; assumed ratio of O^- to e^-_{aq} concn. = 0.8 – 0.9.	72–0437
		See also 1.9.						

[a] The rate law is $-d[e^-_{aq}]/dt = 2k[e^-_{aq}]^2$; values of k are given here (not $2k$).

TABLE 2. *Reactions of hydrated electrons with inorganic solutes*

No.	Solute and Reaction	pH	$k(dm^3 mol^{-1} s^{-1})$	Ratio	Source	Method	Comment	Ref.
S1.6	BrO_4^- $e_{aq}^- + BrO_4^- \rightarrow BrO_3^- + O^-$	~7	$(7.0 \pm 0.7) \times 10^9$	—	p.r.	opt.	d.k.; counter ion K^+.	73-0106
S1.7	HCN	—	2×10^8 (rel.)	$k/k_{nitrate} = 0.019$	γ-r.	chem.	c.k.; assume $k(e_{aq}^- + NO_3^-) = 1.1 \times 10^{10}$.	68-0593
		7.7-9.1	$(4.3 \pm 0.8) \times 10^8$	—	p.r.	opt.	d.k.; cor. for pK_a.	73-0071
S1.8	C_2N_2 $e_{aq}^- + (CN)_2 \rightarrow (CN)_2^-$	6	$(2.1 \pm 0.2) \times 10^{10}$	—	p.r.	opt.	d.k. (e_{aq}^-) as well as p.b.k. (adduct).	71-0038
S1.9	CNS^-	~5.7	7×10^6 (± 40%)	—	p.r.	opt.	d.k.; cor. for reaction of e_{aq}^- with matrix; k_{obs} decreases with concn.; no abs. by e_{aq}^- obs. ≥ 1 mol/dm^3; counter ion K^+.	72-0475
		See also 1.37.						
S1.10	Cd^{2+} $e_{aq}^- + Cd^{2+} \rightarrow Cd^+$	acid	~2.5×10^{10} (rel.)	$k/k_{H^+} \cong 1.1$	p.r.	condy.	c.k.; assume $k_{H^+} = 2.3 \times 10^{10}$; counter ions ClO_4^-, SO_4^{2-}.	70-0512
		6.1	6.0×10^{10}	—	p.r.	opt.	d.k.; k also detd. at 6.4 kbar (6.4×10^8 N/m^2); counter ion SO_4^{2-}.	72-0102
		See also 1.38.						
S1.11	ClO^- $e_{aq}^- + ClO^- \rightarrow Cl^- + O^-$	—	$(5.3 \pm 1.0) \times 10^{10}$	—	p.r.	opt.	d.k.; counter ion Na^+.	72-0301
		See also 1.54.						
S1.12	ClO_2^- $e_{aq}^- + ClO_2^- \rightarrow ClO^- + O^-$	—	$(4.5 \pm 0.5) \times 10^{10}$	—	p.r.	opt.	d.k.; counter ion Na^+.	72-0301
S1.13	ClO_3^-	—	$< 10^6$	—	p.r.	opt.	solute has no effect on d.k. of e_{aq}^-.	72-0301
		See also 1.55.						
S1.14	$Co(CN)_5^{3-}$ $e_{aq}^- + Co(CN)_5^{3-} \rightarrow Co(CN)_5^{4-}$	~ 13	$(1.2 \pm 0.2) \times 10^{10}$	—	p.r.	opt.	d.k.; $k_H/k_D \cong 1.2$.	71-0097
		See also 1.59.						
S1.15	$Co(CN)_6^{3-}$	7, 13	$(5.4 \pm 1.7) \times 10^9$	—	p.r.	opt.	d.k.; H_2-satd.; counter ion K^+.	71-0364
		See also 1.76.						
S1.16	$Co(CN)_5H^{3-}$	13	$(6.7 \pm 0.7) \times 10^9$	—	p.r.	opt.	d.k.; H_2-satd.; in D_2O $k = 5.6 \times 10^9$; counter ion K^+.	71-0364
S1.17	$Co(CN)_5NCS^{3-}$	7	$(1.6 \pm 0.2) \times 10^{10}$	—	p.r.	opt.	d.k.; H_2-satd.; contains formate ion; counter ion $(C_4H_9)_4N^+$.	71-0364
S1.18	$Co(CN)_5H_2O^{2-}$	7	1.2×10^{10}	—	p.r.	opt.	d.k.; counter ion K^+; $pK \cong 10$.	71-0364
S1.19	$Co(CN)_5OH^{3-}$	13	1.1×10^{10}	—	p.r.	opt.	d.k.; H_2-satd.; in D_2O $k = 1.07 \times 10^{10}$; counter ion K^+.	71-0364
		See also 1.78.						

TABLE 2. *Reactions of hydrated electrons with inorganic solutes* — Continued

No.	Solute and Reaction	pH	k($dm^3 mol^{-1} s^{-1}$)	Ratio	Source	Method	Comment	Ref.
S1.20	$Co(CN)_5I^{3-}$	7	$(2.1 \pm 0.2) \times 10^{10}$	—	p.r.	opt.	d.k. at 478 nm; H_2–satd.; contains formate ion; counter ion K^+.	71–0364
S1.21	$Co(CN)_5NO^{3-}$	—	$(9.7 \pm 0.5) \times 10^9$	$k/k_{nitrate}$ = 0.88	γ–r.	chem.	c.k.; assume $k_{nitrate} = 1.1 \times 10^{10}$; counter ion K^+.	71–0407
S1.22	$Co(terpy)_2^{3+}$	—	6.5×10^{10}	—	p.r.	opt.	p.b.k. (transient precursor to $Co(terpy)_2^{2+}$).	72–0381
S1.23	$Cr(CN)_5NO^{3-}$	—	$(3.6 \pm 0.4) \times 10^9$	$k/k_{nitrate}$ = 0.33	γ–r.	chem.	c.k.; assume $k_{nitrate} = 1.1 \times 10^{10}$; counter ion K^+.	71–0407
S1.24	$Cr(C_2O_4)_3^{3-}$	6.7	6.5×10^9	—	p.r.	opt.	d.k.; k also detd. at 6.4 kbar (6.4×10^8 N/m^2); counter ion K^+.	72–0102
S1.25	Cu^{2+}	acid	$\sim 4 \times 10^{10}$	—	p.r.	condy.	d.k.; counter ions ClO_4^-, SO_4^{2-}.	70–0512
	$e_{aq}^- + Cu^{2+} \rightarrow Cu^+$	—	3.0×10^{10}	—	p.r.	opt.	d.k.; $k = 4.4 \times 10^9$ in sodium dodecyl sulfate soln. and 1.6×10^{10} in hexadecyltrimethylammonium bromide soln.	73–1004
		See also 1.102.						
S1.26	Eu^{3+}	~ 6	$(6.1 \pm 0.3) \times 10^{10}$ (cor.)	—	p.r.	opt.	d.k.	71–0311
		See also 1.127.						
S1.27	Fe^{3+}	1.8	$\sim 5 \times 10^{10}$ (rel.)	$k/k_{H^+} \cong 2$	γ–r.	chem.	c.k.; in H_2SO_4 or $HClO_4$; assume $k_{H^+} = 2.3 \times 10^{10}$.	71–0203
	$e_{aq}^- + Fe^{3+} \rightarrow Fe^{2+}$							
S1.28	$FeSO_4^+$	2.1–2.9	$\sim 2 \times 10^{10}$ (rel.)	$k/k_{H^+} = 0.95 \pm 0.1$	γ–r.	chem.	c.k.; soln. contains 0.5 mol/dm^3 Na_2SO_4 in H_2SO_4.	71–0203
	$e_{aq}^- + Fe(III) \rightarrow Fe(II)$							
S1.29	$HFe(CN)_6^{3-}$	~3	$(2 \pm 0.8) \times 10^9$ (rel.) (cor.)	$k/k_{N_2O} = 0.25 \pm 0.1$ (cor.)	phot.	chem.	c.k.; ratio = 0.75 at $\mu = 0.042$; assumed $k(e_{aq}^- + N_2O) = 8.7 \times 10^9$.	66–7025
	$e_{aq}^- + HFe(CN)_6^{3-} \rightarrow H + Fe(CN)_6^{4-}$							
S1.30	$Fe(CN)_6^{3-}$	—	—	$k_1/k_2 \cong 0.1 - 0.2$	p.r.	condy.	estd.	70–0254
	$e_{aq}^- + Fe(CN)_6^{3-} \rightarrow Fe(CN)_5(H_2O)^{3-} + CN^-$ (1)	alk.	3×10^9 (rel.)	—	Al–NaOH	chem.	obs. effect of solute on H_2 evolution.	70–0465
	$e_{aq}^- + Fe(CN)_6^{3-} \rightarrow Fe(CN)_6^{4-}$ (2)	*See also* 1.137.						
S1.31	H^+	acid	3.0×10^{10}	—	p.r.	opt.	d.k.	71–0475
	$e_{aq}^- + H^+ \rightarrow H$	acid	2.2×10^{10}	—	p.r.	opt.	d.k.; k(1.6 to 2.2) $\times 10^{10}$ and E_a (1.4 – 2.4 kcal/mol or 5.9 – 10.0 kJ/mol) vary with concn. of added ethanol, KI, and $MgCl_2$.	71–0580

TABLE 2. *Reactions of hydrated electrons with inorganic solutes* — Continued

No.	Solute and Reaction	pH	$k(dm^3 mol^{-1} s^{-1})$	Ratio	Source	Method	Comment	Ref.
S1.31	H^+ (contd.)	~3	1.3×10^{10} (rel.)	$k/k_{N_2O} = 1.54$	photo-effect	pol.	c.k.; assume $k(e^-_{aq} + N_2O) = 8.7 \times 10^9$; 0.2 *M* KCl; indirect method.	71-7393
		—	2.2×10^{10}	—	p.r.	opt.	d.k.; *k* increases with pressure → 3.5 kbar, then remains constant → 6.4 kbar (6.4×10^8 N/m^2).	72-0298
		—	2.3×10^{10}	—	p.r.	opt.	d.k.; $k = 7.5 \times 10^9$ in sodium dodecyl sulfate soln.	73-1004
		—	2.4×10^{10} (cor.)	—	p.r.	opt.	d.k.; *k* unchanged in mixtures up to 99% ethanol.	73-1008
		See also 1.143; the value 2.3×10^{10} has been used to calculate specific rates from relative rates for the following reactions: S1.10, S1.27, S1.28, S1.45, S1.80, S1.157, S1.193, S1.194, S1.256, S1.294, S1.304, S1.306, S1.307, S1.365. The value 1.57×10^{10} has been used to calculate specific rates from relative rates at $\mu = 0.05$ for the following reactions: S1.78, S1.135, S1.246, S1.260, S1.273, S1.297, S1.303, S1.386, S1.402.						
S1.32	H_2O_2	alk.	7.0×10^9 (rel.)	—	Al-NaOH	chem.	obs. effect of solute on H_2 formation.	70-0465
		6.1	1.6×10^{10}	—	p.r.	opt.	d.k.; *k* also detd. at 6.4 kbar (6.4×10^8 N/m^2).	72-0102
		See also 1.146.						
S1.33	$HgCl_2$ $e^-_{aq} + HgCl_2 \rightarrow HgCl + Cl^-$	5.0	$(4.0 \pm 0.3) \times 10^{10}$	—	p.r.	opt.	d.k.	73-0043
S1.34	I^-	7	$< 2.4 \times 10^5$ (± 15%)	—	p.r.	opt.	d.k.	70-1226
S1.35	I_2	—	5.1×10^{10}	—	p.r.	opt.	d.k.; $k = 1.5 \times 10^{10}$ in sodium dodecyl sulfate soln.	73-1004
		See also 1.156.						
S1.36	K^+ $e^-_{aq} + K^+ \rightarrow (K^+ — e^-)$	>14	2.4×10^5	—	p.r.	opt.	d.k. and p.b.k. at 720 nm in 14.5 *M* KOH; *k* for decay of $(K^+ — e^-) = 2.6 \times 10^7 s^{-1}$.	72-0555
		See also 1.165.						
S1.37	Omitted							
S1.38	NH_2NH_2	10.5	2.3×10^6 (± 15%)	—	p.r.	opt.	d.k.	72-0003
		See also 1.179.						
S1.39	$NH_2NH_3^+$	6.0	2.2×10^8 (± 15%)	—	p.r.	opt.	d.k.	72-0003
		See also 1.180.						
S1.40	NH_2OH	9.0	9.2×10^8	—	p.r.	opt.	d.k.	71-0493
		See also 1.181.						
S1.41	NH_3OH^+	4.8	1.2×10^{10}	—	p.r.	opt.	d.k.	71-0493
		See also 1.182.						

TABLE 2. *Reactions of hydrated electrons with inorganic solutes* — Continued

No.	Solute and Reaction	pH	k($dm^3 mol^{-1} s^{-1}$)	Ratio	Source	Method	Comment	Ref.
S1.42	N_2O	—	8.0×10^9	—	p.r.	opt.	d.k.	71–0587
		—	4×10^9	—	photo-effect	pol.	indirect method; contains 1 *M* KCl.	71–7393
		See also 1.186; the value 8.7×10^9 has been used to calculate specific rates of the following reactions from relative rates: S1.29, S1.31, S1.43, S1.44, S1.47, S1.48, S1.62, S1.420.						
S1.43	NO_2^-	9	6×10^9 (rel.)	$k/k_{N_2O} = 0.73$	photo-effect	pol.	c.k.; assume $k(e_{aq}^- + N_2O) = 8.7 \times 10^9$; 0.2 *M* KCl; indirect method.	71–7393
		See also 1.188.						
S1.44	NO_3^- $e_{aq}^- + NO_3^- \rightarrow NO_2 + 2OH^-$	alk.	1.0×10^{10} (rel.)	—	Al–NaOH	chem.	obs. effect of solute on H_2 evolution.	70–0465
		—	9.5×10^9 (rel.)	$k/k_{oxy} = 0.5$	γ–r.	chem.	c.k.; assume $k(e_{aq}^- + O_2) = 1.9 \times 10^{10}$.	71–0166
		—	9.3×10^9	—	p.r.	opt.	d.k.; k(0.7 to 1.5×10^{10}) and E_a (2.5 – 3.5 kcal/mol or 10.5 – 14.6 kJ/mol) vary with concn. of added ethanol, KI, and $MgCl_2$.	71–0580
		—	2.5×10^{10} (rel.)	$k/k_{N_2O} = 2.86$	photo-effect	pol.	c.k.; assume $k(e_{aq}^- + N_2O) = 8.7 \times 10^9$; 0.2 *M* KCl; indirect method.	71–7393
		6.4	1.0×10^{10}	—	p.r.	opt.	d.k.; k also detd. at 6.4 kbar (6.4×10^8 N/m^2). counter ion Na^+.	72–0102
		11.5	1.1×10^{10}	—	f.phot.	opt.	d.k.	72–7158
		—	1.1×10^{10}	—	p.r.	opt.	d.k.; k unchanged in anionic or cationic surfactant soln.	73–1004
		—	8.6×10^9 (cor.)	—	p.r.	opt.	d.k.; k decreases with added ethanol to 3×10^7 at 99% ethanol.	73–1008
		See also 1.189; the value 1.1×10^{10} has been used to calculate specific rates of the following reactions from relative rates: S1.7, S1.21, S1.23, S1.43, S1.203.						
S1.45	Ni^{2+} $e_{aq}^- + Ni^{2+} \rightarrow Ni^+$	acid	1.2×10^{10} (rel.)	$k/k_{H^+} = 0.54$	p.r.	condy.	c.k.; assume $k_{H^+} = 2.3 \times 10^{10}$; counter ions ClO_4^-, SO_4^{2-}.	70–0512
		See also 1.193.						
S1.46	$Ni(NH_3)_n^{2+}$	11.3	$(8.4 \pm 1.2) \times 10^9$	—	p.r.	opt.	d.k.; contains 0.67 mol/dm^3 NH_3.	72–0460
S1.47	O_2	6.4	2.2×10^{10}	—	p.r.	opt.	d.k.; k also detd. at 6.4 kbar (6.4×10^8 N/m^2).	72–0102

TABLE 2. *Reactions of hydrated electrons with inorganic solutes* — Continued

No.	Solute and Reaction	pH	k(dm^{3}mol^{-1}s^{-1})	Ratio	Source	Method	Comment	Ref.
S1.47	O_2 (contd.)	11	1.9×10^{10} (rel.)	$k/k_{N_2O} = (2.3 \pm 0.2)$	γ-r.	chem.	c.k.; assume $k(e^-_{aq} + N_2O) = 8.7 \times 10^9$; preirradiated NaCl was added to the soln. to produce the e^-_{aq}; higher ratios are obtained at higher O_2 concn.	72-0430
		12	1.6×10^{10}		f.phot.	opt.	d.k.	72-7036
		See also 1.205; the value 1.9×10^{10} has been used to calculate specific rates of the following reactions from relative rates: S1.44, S1.393.						
S1.48	$H_2PO_4^-$ $e^-_{aq} + H_2PO_4^- \rightarrow H + HPO_4^{2-}$	7–9	2.2×10^7 (rel.) (cor.)	$k/k_{N_2O} = (8.8 \pm 0.7) \times 10^{-3}$	phot.	chem.	c.k. at $\mu = 1.45$; k calcd. assuming $k(e^-_{aq} + N_2O) = 8.7 \times 10^9$ and cor. to $\mu = 0$.	66-7190
		6.8	1.0×10^7	—	p.r.	opt.	d.k.	72-0380
		4	$(6.6 \pm 0.8) \times 10^6$ (cor.)	—	p.r.	opt.	d.k.; k_{obs} = $(11.7 \pm 8) \times 10^5$ at $\mu = 0.1$.	73-1049
		See also 1.211.						
S1.49	HPO_4^{2-}	9–12.3	$(1.8 \pm 0.8) \times 10^4$ (cor.)	—	p.r.	opt.	d.k.; k_{obs} = $(1.4 \pm 0.6) \times 10^5$ at $\mu = 0.6$.	73-1049
S1.50	$HP_2O_7^{3-}$	9.7–10.3	$(1.1 \pm 0.3) \times 10^5$ (cor.)	—	p.r.	opt.	d.k.; k_{obs} = $(24 \pm 6) \times 10^5$ at $\mu = 0.8$.	73-1049
		See also 1.212.						
S1.50a	$P_2O_8^{4-}$	*See* 1.213. The rate listed is unpublished and did not appear in the reference cited.						
S1.51	Pr^{3+}	5.5	$(6 \pm 1) \times 10^6$	—	p.r.	opt.	d.k.; concn. 10^{-1} *M*.	72-0066
		See also 1.223.						
S1.52	$PtCl_4^{2-}$ e^-_{aq} + Pt(II) → Pt(I)	7	9.3×10^9	—	p.r.	opt.	p.b.k. at 310 nm.	69-0144
		See also 1.225.						
S1.53	$Pt(CN)_4^{2-}$ e^-_{aq} + Pt(II) → electron adduct	11	$(4.4 \pm 1.1) \times 10^9$	—	p.r.	opt.	p.b.k. at 360 nm.	69-0144
		See also 1.226.						
S1.54	$Ru(bipy)_3^{2+}$	—	8.2×10^{10}	—	p.r.	opt.	d.k.	72-0381
S1.55	$Ru(NH_3)_5N_2^{2+}$ $e^-_{aq} + Ru(NH_3)_5N_2^{2+} \rightarrow Ru(NH_3)_5N_2^+$	—	4.2×10^9	—	p.r.	opt.	d.k.	71-0234
		See also 1.231a.						
S1.56	$Ru(NH_3)_5Br^{2+}$	—	5.0×10^{10}	—	p.r.	opt.	d.k.	73-0107
S1.57	$Ru(NH_3)_5Cl^{2+}$	—	6.0×10^{10}	—	p.r.	opt.	d.k.	73-0107
		See also 1.231a.						
S1.58	$Ru(NH_3)_5I^{2+}$	—	$\sim 6 \times 10^{10}$	—	p.r.	opt.	d.k.	73-0107
S1.59	$Ru(NH_3)_5OH^{2+}$	6	5.9×10^{10}	—	p.r.	opt.	d.k.	73-0107
S1.60	$Ru(bipy)_3^{3+}$ $e^-_{aq} + Ru(bipy)_3^{3+} \rightarrow Ru(bipy)_3^{2+} + h\nu$	4.5	$\sim 6 \times 10^{10}$	—	p.r.	opt.	d.k.; the reaction produces chemiluminescence, $\phi = 0.015 \pm 0.004$.	72-0462
S1.61	HS^-	10.9–12.7	$(3.0 \pm 0.4) \times 10^7$	—	p.r.	opt.	d.k.	73-1012
		See also 1.236.						

TABLE 2. *Reactions of hydrated electrons with inorganic solutes* — Continued

No.	Solute and Reaction	pH	k(dm^{3}mol^{-1}s^{-1})	Ratio	Source	Method	Comment	Ref.
S1.62	SF_6	—	1.7×10^{10} (rel.)	$k/k_{N_2O} = 2.0 \pm 0.2$	phot.	chem.	c.k.; I^- soln. ($\mu = 0.05$); ferrocyanide soln. ($\mu = 0.0035$); assume $k(e^-_{aq} + N_2O) = 8.7 \times 10^9$.	71–7395
	See also 1.237.							
S1.63	SO_3^{2-} $e^-_{aq} + SO_3^{2-} \rightarrow$ prod. ($HSO_3^{2-} + OH^-$?)	—	$\leq 2 \times 10^6$ (rel.)	—	f.phot.	opt.	concn. 10^{-2} mol/dm^3; N_2–satd.; c.k. with NO_3^-.	68–7072
		alk.	$\leq 1.5 \times 10^6$	—	p.r.	opt.	d.k.; Ar–satd.; half-life of e^-_{aq} increases with sulfite concn.	71–0461
		> 9	no reaction	—	f.phot.	opt.	first order e^-_{aq} decay unchanged in sulfite concn. 10^{-4}–10^{-2} mol/dm^3.	72–7008
	See also 1.238.							
S1.64	HSO_3^- $e^-_{aq} + HSO_3^- \rightarrow H + SO_3^{2-}$	8.0–8.5	$(2 \pm 1) \times 10^7$ (cor.)	—	f.phot. and p.r.	opt.	d.k.; concn. $(3 - 8) \times 10^{-3}$ mol/dm^3 (pK = 7.2).	72–7008
S1.65	$S_2O_3^{2-}$ $e^-_{aq} + S_2O_3^{2-} \rightarrow {}\cdot S^- + SO_3^{2-}$ (72–5050)	—	3.8×10^7	—	p.r.	opt.	d.k.; single pulse to minimize colloidal S formn.	72–0611
	See also 1.240.							
S1.66	$S_2O_4^{2-}$	—	$(1.3 \pm 0.1) \times 10^9$	—	p.r.	opt.	d.k.	72–0611
S1.67	$S_2O_6^{2-}$	—	$(2.7 \pm 0.2) \times 10^6$	—	p.r.	opt.	d.k.	72–0611
S1.68	$S_2O_8^{2-}$	5.7	1.4×10^{10}	—	p.r.	opt.	d.k.; k also detd. at 6.4 kbar (6.4×10^8 N/m^2); counter ion K^+.	72–0102
	See also 1.242.							
S1.69	$S_3O_6^{2-}$	6.8	$(3.3 \pm 0.2) \times 10^9$	—	p.r.	opt.	d.k.	72–0611
S1.70	$S_4O_6^{2-}$	—	$(5.4 \pm 0.2) \times 10^9$	—	p.r.	opt.	d.k.	72–0611
		—	$(5.8 \pm 1) \times 10^9$	—	p.r.	opt.	d.k.	73–1027
S1.71	Sm^{3+}	~ 6	$(2.7 \pm 0.3) \times 10^{10}$ (cor.)	—	p.r.	opt.	d.k.	71–0311
		5.6	2.2×10^{10}	—	p.r.	opt.	d.k.; k also detd. at 6.4 kbar (6.4×10^8 N/m^2); counter ion SO_4^{2-}.	72–0102
	See also 1.250.							
S1.72	Tl^+	—	2.8×10^{10}	—	p.r.	opt.	d.k.; addn. of 0.1 – 0.3 mol/dm^3 ethanol gave k = (3.0 to 3.7) $\times 10^{10}$ and $E_a \cong 3 - 5$ kcal/mol (12 – 21 kJ/mol) detd. at 10 – 75°C.	71–0580
		6.1	5.4×10^{10}	—	p.r.	opt.	d.k.; k also detd. at 6.4 kbar (6.4×10^8 N/m^2); counter ion SO_4^{2-}.	72–0102
	See also 1.265.							
S1.73	Yb^{3+}	~ 6	$(4.7 \pm 0.3) \times 10^{10}$ (cor.)	—	p.r.	opt.	d.k.	71–0311
	See also 1.272.							
S1.74	Zn^{2+}	—	10^9 (cor.)	—	p.r.	opt.	d.k.; k increases in mixtures up to 60% ethanol.	73–1008
	See also 1.274.							

TABLE 3. *Reactions of hydrated electrons with organic solutes*

No.	Solute and Reaction	pH	k(dm^3/mol·s)	Ratio	Source	Method	Comment	Ref.
S1.75	acetamide	9.2	3.5×10^7	—	p.r.	opt.	d.k.	71–0414, 73–0091
	$e^-_{aq} + CH_3CONH_2 \rightarrow CH_3\dot{C}(O^-)NH_2$	5.2	4.5×10^7	—	p.r.	opt.	d.k.; k increases with pressure 0–6.4 kbar (6.4 x 10^8 N/m^2).	72–0298
		See also 1.286.						
S1.76	2–acetamido–2–deoxy–D–galactose	—	1.1×10^7	—	p.r.	opt.	d.k.	70–3081
S1.77	acetate ion	—	4.3×10^4	—	p.r.	opt.	d.k.; concn. 1.8 mol/dm^3 Na acetate.	71–0475
		See also 1.287.						
S1.78	acetic acid	2.0	5.8×10^8	—	p.r.	opt.	d.k.	72–0187
	$e^-_{aq} + CH_3COOH \rightarrow OH^- + CH_3CO$ (1)	3–4	1.72×10^7 (rel.)(1)	$k/k_{H^+} = 1.1 \times 10^{-3}$	γ–r.	chem.	c.k.; $\mu = 0.05$; assume $k_{H^+} = 1.57 \times 10^{10}$ at that μ.	72–0057
	$e^-_{aq} + CH_3COOH \rightarrow H + CH_3COO^-$ (2)		1.51×10^7 (rel.)(2)	$k_2/k_1 = 0.88$				
		See also 1.288.						
S1.79	acetoacetate ion	8.9	$(4.8 \pm 0.5) \times 10^9$	—	p.r.	opt.	d.k.	73–0073
S1.80	acetone	0–2	1×10^{10} (rel.)	$k/k_{H^+} = 0.42$	phot.	chem.	c.k.; I^- soln.; ratio increases to 1.02 with concn. 0.1 → 2 M; ratio is for lowest concn.	71–0462
		—	1×10^{10} (rel.)	$k/k_{H^+} = 0.48$	γ–r.	chem.	c.k.; ratio increases to 2.40 with concn. 0.02 – 2 M; ratio given is for lowest concn.	71–0462
		—	6.5×10^9	—	p.r.	opt.	d.k.; $\mu = 0$; k unchanged in water–ethanol mixtures.	73–1008
		See also 1.289; the value 6×10^9 has been used to calculate a specific rate for S1.158 from a relative rate.						
S1.81	acetone oxime	7.0	3.5×10^8	—	p.r.	opt.	d.k.; k increases with pressure → 6.4 kbar (6.4 x 10^8 N/m^2).	72–0298
		See also 1.291.						
S1.82	acetophenone	~9.2	2.8×10^{10} (± 10%)	—	p.r.	opt.	d.k.	72–0171
S1.83	*N*–acetylalanyl–alanylalanine	9.2	6.8×10^8	—	p.r.	opt.	d.k.	74–1058
S1.84	*N*–acetylalanyl–alanylalanyl–alanylalanyl–alanine	9.2	8.2×10^8	—	p.r.	opt.	d.k.	74–1058
S1.85	*N*–acetylcysteamine	7.1	9.1×10^9 (± 10%)	—	p.r.	opt.	d.k.; $pK_a \cong 9.5$.	73–0090
		12.6	1.9×10^9 (± 10%)					
S1.86	*N*–acetylcysteine	7.1	5.6×10^9 (± 10%)	—	p.r.	opt.	d.k.; $pK_a \cong 2$, 9.5.	73–0090
		12.5	3.3×10^8 (± 10%)					
S1.87	*N*–acetylglycine	11.5	2.6×10^6	—	p.r.	opt.	d.k. at 700 nm.	71–3052
		See also 1.296.						
S1.88	*N*–acetylglycine amide	9.2	2.1×10^8	—	p.r.	opt.	d.k. at 700 nm.	71–3052
S1.89	*N*–acetylglycine methyl ester	8.7	3.3×10^8	—	p.r.	opt.	d.k. at 700 nm.	71–3052
S1.90	*N*–acetylglycyl–glycine	11.2	6.4×10^7	—	p.r.	opt.	d.k. at 700 nm.	71–3052
S1.91	*N*–acetylglycyl–glycine amide	9.2	4.2×10^8	—	p.r.	opt.	d.k. at 700 nm.	71–3052

TABLE 3. *Reactions of hydrated electrons with organic solutes* — Continued

No.	Solute and Reaction	pH	$k(dm^3mol^{-1}s^{-1})$	Ratio	Source	Method	Comment	Ref.
S1.92	*N*–acetylglycyl–glycylglycine	9.2	4.4×10^8	—	p.r.	opt.	d.k.	74–1058
S1.93	*N*–acetylphenyl–alanine	9.2	5.3×10^7	—	p.r.	opt.	d.k.	73–0076
S1.94	*N*–acetylphenyl–alanine amide	9.3	2.5×10^8	—	p.r.	opt.	d.k.	73–0076
S1.95	*N*–acetylphenyl–glycine	9.2	1.7×10^8	—	p.r.	opt.	d.k.	73–0076
S1.96	*N*–acetylsarcosine	12.5	9×10^6	—	p.r.	opt.	d.k.	74–1058
S1.97	*N*–acetylsarcosyl–sarcosylsarcosine	9.0	3.9×10^8	—	p.r.	opt.	d.k.	74–1058
	4–(2–acetylsulfamoyl)phthalanilic acid *See* thalamyd (S1.413).							
S1.98	acriflavine	13	$(3.3 \pm 0.3) \times 10^{10}$	—	p.r.	opt.	d.k.	67–6053, 67–0239
		See also 1.298a.						
S1.99	acrylamide	11	9.7×10^9 (±15%)	—	f.phot.	opt.	d.k.; H_2–satd.	71–7345
		6.3	2.0×10^{10}	—	p.r.	opt.	d.k.; k also detd. at 6.4 kbar (6.4×10^8 N/m^2).	72–0102
		9.2	$(3.1 \pm 0.1) \times 10^{10}$	—	p.r.	opt.	d.k.	73–0072
		See also 1.299.						
S1.100	acrylate ion	9.2	$(5.3 \pm 0.5) \times 10^9$	—	p.r.	opt.	d.k.	73–0072
S1.101	acrylic acid	1.5–3.5	$(2.2 \pm 0.2) \times 10^{10}$	—	p.r.	opt.	d.k.; also c.k.	73–0072
S1.102	acrylonitrile	11	1×10^{10} (± 15%)	—	f.phot.	opt.	d.k.; H_2–satd.	71–7345
S1.103	ACTH, porcine	—	2.1×10^{10}	—	—	—	—	70–1056
S1.104	ACTH, synthetic	—	1.5×10^{10}	—	—	—	—	70–1056
S1.105	adenine	7	9.0×10^9	—	p.r.	opt.	d.k.; $\mu = 0.1$; $pK_a = 9.8$.	71–0375
		11	1.1×10^9					
		—	9×10^9	—	p.r.	opt.	d.k. (e^-_{aq}) or p.b.k. (radical anion).	73–3016
		See also 1.300.						
S1.106	adenine polynucleotides (poly A)	7	2.5×10^8	—	p.r.	opt.	d.k.; mol. wt. 2×10^5; k per base unit.	71–0375
S1.107	adenine + uracil polynucleotides (poly A + U)	7	1.3×10^8	—	p.r.	p.r.	d.k.; mol. wt. 5×10^5; k per base unit.	71–0375
S1.108	adenosine	6–11	9.2×10^9	—	p.r.	opt.	d.k.; $\mu = 0.1$; $pK_a = 12.5$.	71–0375
		See also 1.301.						
S1.109	adenosine 5′–phosphate ion	6–12	3.6×10^9	—	p.r.	opt.	d.k.; $\mu = 0.1$.	71–0375
		See also 1.302.						
S1.110	alanine	7.4	1.2×10^7	—	p.r.	opt.	d.k.	74–1058
		See also 1.303–4.						
S1.111	β–alanine	6.9	4.2×10^6	—	p.r.	opt.	d.k.	74–1058
		See also 1.305.						
S1.112	alanine anhydride	9.2	$(2.0 \pm 0.1) \times 10^9$	—	p.r.	opt.	d.k.	71–0554
S1.113	β–alanylglycylglycine	6.4	2.8×10^8	—	p.r.	opt.	d.k.	74–1058
		12.2	7.1×10^7	—	p.r.	opt.	d.k.	74–1058
S1.113a	albumin (bovine serum)	6.0	$(4.07 \pm 0.15) \times 10^{10}$	—	p.r.	opt.	d.k.	73–3020
S1.114	alcohol dehydrogenase	7	2.4×10^9 (± 15%)	—	p.r.	opt.	d.k.	70–1226
S1.115	2–aminoacetamide (glycine amide)	6.5	2.1×10^9	—	p.r.	opt.	d.k.; 90% deamination.	71–3052
	$e^-_{aq} + NH_3^+CH_2CONH_2 \rightarrow \cdot CH_2CONH_2 + NH_3$	11.4	2.8×10^8	—	p.r.	opt.	d.k.	71–3052
S1.116	*p*–aminobenzoate ion	11	$(1.8 \pm 0.3) \times 10^9$	—	f.phot.	opt.	d.k.	72–0423
		See also 1.310.						

TABLE 3. *Reactions of hydrated electrons with organic solutes* — Continued

No.	Solute and Reaction	pH	k($dm^3 mol^{-1} s^{-1}$)	Ratio	Source	Method	Comment	Ref.
S1.117	7-aminocephalosporanic acid	6.0	8.6×10^9	—	p.r.	opt.	d.k.	73-3020
S1.118	2-amino-2-deoxy-D-galactose	—	8.4×10^7	—	p.r.	opt.	d.k.	70-3081
S1.119	6-aminopenicillanic acid	6.0	3.6×10^9	—	p.r.	opt.	d.k.	73-3020
S1.120	ampicillin	6.0	5.7×10^9	—	p.r.	opt.	d.k.	73-3020
S1.121	amylamine	13	$(1.0 \pm 0.1) \times 10^6$	—	p.r.	opt.	d.k.	73-0016
		See also 1.313b.						
S1.122	amylammonium ion	8.5	$(2.7 \pm 0.1) \times 10^6$	—	p.r.	opt.	d.k.	73-0016
S1.123	aniline							
	$e^-_{aq} + C_6H_5NH_2 \rightarrow C_6H_6NH_2 + OH^-$	10	$(2.6 \pm 0.3) \times 10^7$	—	p.r.	opt.	d.k.	72-0289
		See also 1.314.						
S1.124	9,10-anthraquinone-1-sulfonate ion	—	2.3×10^{10}	—	p.r.	opt.	d.k.	72-0391
S1.125	9,10-anthraquinone-2-sulfonate ion	~9.2	2.2×10^{10} (± 10%)	—	p.r.	opt.	d.k.	72-0171
		—	2.8×10^{10}	—	p.r.	opt.	d.k.	72-0391
S1.126	anthrone	~9.2	3.3×10^{10} (± 10%)	—	p.r.	opt.	d.k.	72-0171
S1.127	ascorbate ion	7	4×10^8	—	p.r.	opt.	d.k.	72-0266
S1.128	aspartic acid	3.0		$k/k_{BrPhOH} = 0.147$	γ-r.	chem.	c.k.; assumed $k_{BrPhOH} = 6.0 \times 10^9$ to calculate k for various ionic forms; pK_a = 2.10, 3.86.	72-0027
		7.0		$k/k_{BrPhOH} = 2.5 \times 10^{-3}$				
	positive ion		5×10^9 (calcd.)					
	zwitterion		5×10^8 (calcd.)					
	negative ion		1.5×10^7 (calcd.)					
		See also 1.321-2.						
S1.129	azurin	7.0	$(1.0 \pm 0.3) \times 10^{11}$	—	p.r.	opt.	d.k. at 550 nm. (e^-_{aq}) as well as at 625 nm. (Cu-II ion); mol. wt. 16,000; *pseudomonas* azurin.	71-3064, 72-1003
S1.130	barbituric acid	2.6		$k/k_{BrPhOH} = 1.55$	γ-r.	chem.	c.k.; assume $k_{BrPhOH} = 6.0 \times 10^9$ to calculate k for ionic forms; pK_a = 4.01.	72-0027
		4.0		$k/k_{BrPhOH} = 0.733$				
		5.0		$k/k_{BrPhOH} = 0.167$				
		7.6		$k/k_{BrPhOH} = 0.0157$				
	e^-_{aq} + acid		9.5×10^9 (calcd.)					
	e^-_{aq} + anion		9.0×10^7 (calcd.)					
S1.131	benzamide	5.7	1.9×10^{10}	—	p.r.	opt.	d.k.; k also detd. at 6.4 kbar (6.4×10^8 N/m^2).	72-0102
		~9.2	1.9×10^{10} (± 10%)	—	p.r.	opt.	d.k.	72-0171
		See also 1.323.						
S1.132	benzene	—	1.46×10^7 (± 15%)	—	p.r.	opt.	d.k.	71-0475
		—	1.3×10^7	—	p.r.	opt.	d.k.; also reported k in solutions of surfactants.	71-0586
			1.1×10^8 (in hexadecyltrimethylammonium bromide)					
			4×10^6 (in dodecyl sodium sulfate)					
			6×10^6 (in Igepal CO-730)					
		See also 1.324.						
S1.133	benzenesulfonamide	—	9.8×10^9	—	p.r.	opt.	d.k.	73-0094
		See also 1.325.						
S1.134	benzil	~9.2	3.6×10^{10} (± 10%)	—	p.r.	opt.	d.k.	72-0171
S1.135	benzoic acid	3-4	7.08×10^9 (rel.)	$k_1/k_{H^+} = 0.451$	γ-r.	chem.	c.k.; $\mu = 0.05$; assume $k_{H^+} = 1.57 \times 10^{10}$ at that μ; cor. for e^-_{aq} + anion.	72-0057
	$e^-_{aq} + C_6H_5COOH \rightarrow OH^- + C_6H_5CO$ (1)			$k_2/k_1 \leq 0.1$				
	$e^-_{aq} + C_6H_5COOH \rightarrow H + C_6H_5COO^-$ (2)							
		—	3.0×10^9	—	p.r.	opt.	d.k.	73-0094
		See also 1.327a.						

TABLE 3. *Reactions of hydrated electrons with organic solutes* — Continued

No.	Solute and Reaction	pH	$k(dm^3 mol^{-1} s^{-1})$	Ratio	Source	Method	Comment	Ref.
S1.136	benzoin	~9.2	1.7×10^{10} (±10%)	—	p.r.	opt.	d.k.	72-0171
S1.137	benzophenone	~9.2	2.8×10^{10} (± 10%)	—	p.r.	opt.	d.k.	72-0171
		See also 1.329.						
S1.138	benzoquinone	11	$(4.2 \pm 0.7) \times 10^9$	—	f.phot.	opt.	d.k.	71-0437
		~7	4.2×10^{10}	—	p.r.	opt.	d.k.	71-0619
		See also 1.330.						
S1.139	3-benzoyl-*N*-methylpyridinium ion	9.0	$(5.5 \pm 0.7) \times 10^{10}$	—	p.r.	opt.	d.k.	72-0359
S1.140	2-benzoylpyridine	9.0	$(2.5 \pm 0.3) \times 10^{10}$	—	p.r.	opt.	d.k.	72-0359
S1.141	3-benzoylpyridine	9.0	$(3.0 \pm 0.3) \times 10^{10}$	—	p.r.	opt.	d.k.	72-0359
S1.142	4-benzoylpyridine	9.0	$(2.8 \pm 0.3) \times 10^{10}$	—	p.r.	opt.	d.k.	72-0359
S1.143	benzyl acetate $e^-_{aq} + C_6H_5CH_2OOCCH_3 \rightarrow C_6H_5CH_2 + CH_3COO^-$	—	1.1×10^9	—	p.r.	opt.	p.b.k. (benzyl radical).	73-0089
S1.144	benzyl alcohol	6.5	2×10^8	—	p.r.	opt.	d.k.; k increases with pressure → 6.4 kbar.	72-0298
		See also 1.331.						
S1.145	benzyl bromide $e^-_{aq} + C_6H_5CH_2Br \rightarrow C_6H_5CH_2 + Br^-$	—	1.5×10^9	—	p.r.	opt.	p.b.k. (benzyl radical).	73-0089
S1.146	benzyl chloride $e^-_{aq} + C_6H_5CH_2Cl \rightarrow C_6H_5CH_2 + Cl^-$	—	1.6×10^9	—	p.r.	opt.	p.b.k. (benzyl radical).	73-0089
		6-7	5×10^9	—	p.r.	opt.	d.k.	73-1041
		See also 1.332.						
S1.147	benzyl formate $e^-_{aq} + C_6H_5CH_2OOCH \rightarrow C_6H_5CH_2 + HCOO^-$	—	1.5×10^9	—	p.r.	opt.	p.b.k. (benzyl radical).	73-0089
S1.148	β-benzylglucoside	~7	$(7 \pm 1.5) \times 10^7$	—	p.r.	opt.	d.k.	71-0480
S1.149	benzyl mercaptan $e^-_{aq} + C_6H_5CH_2SH \rightarrow C_6H_5CH_2 + HS^-$	7.0	8.7×10^9 (± 10%)	—	p.r.	opt.	d.k.	73-0090
S1.150	benzylpenicillin	6.0	$(2.76 \pm 0.08) \times 10^9$	—	p.r.	opt.	d.k.	73-0134, 73-3020
S1.151	benzylpenicillin, methyl ester	6.0	7.0×10^9	—	p.r.	opt.	d.k.	73-3020
S1.152	benzylpenicilloic acid	—	1.4×10^9	—	p.r.	opt.	d.k.	73-0134
S1.153	benzyl thiocyanate $e^-_{aq} + C_6H_5CH_2SCN \rightarrow C_6H_5CH_2 + SCN^-$	—	2.0×10^9	—	p.r.	opt.	p.b.k. (benzyl radical).	73-0089
S1.154	biuret $e^-_{aq} + NH_2CONHCONH_2 \rightarrow NH_2\dot{C}(O^-)NHCONH_2$	10.3	2.5×10^8	—	p.r.	opt.	d.k.	73-0091
S1.155	5-bromoorotate ion	11	3×10^9	—	p.r.	opt.	d.k.	73-0002
S1.156	5-bromoorotic acid	7	1×10^{10}	—	p.r.	opt.	d.k.	73-0002
S1.157	*p*-bromophenol	5-6	7×10^9	—	p.r.	opt.	d.k.	72-0027
		4	5.5×10^9 (rel.)	$k/k_{H^+} = 0.24$	γ-r.	chem.	c.k.; assume $k_{H^+} = 2.3 \times 10^{10}$; also see S1.158.	72-0027
		The value 6.0×10^9 has been used to calculate specific rates of the following reactions from relative rates: S1.128, S1.130, S1.256, S1.257, S1.296, S1.297, S1.401, S1.402. *See also* 1.343, in which 1.2×10^{10} was the standard value used.						
S1.158	*p*-bromophenoxide ion	7	6×10^9 (rel.)	$k/k_{acetone} = 1$	γ-r.	chem.	c.k.; assume $k_{acetone} = 6 \times 10^9$.	72-0027
		7	6.2×10^9 (rel.)	$k/k_{orotate\ ion} = 0.41$	γ-r.	chem.	c.k.; assume $k_{orotate\ ion} = 1.5 \times 10^{10}$.	72-0027
		11	3.4×10^9	—	p.r.	opt.	d.k.	72-0027
		See also 1.344.						

TABLE 3. *Reactions of hydrated electrons with organic solutes* — Continued

No.	Solute and Reaction	pH	$k(dm^3mol^{-1}s^{-1})$	Ratio	Source	Method	Comment	Ref.
S1.159	5-bromouracil	7	1.6×10^{10}	—	p.r.	opt.	d.k.; $\mu = 0.05$.	72-0049
		9	8.2×10^{9}	—	p.r.	opt.	d.k.; $\mu = 0.05$.	72-0049
		11	7.0×10^{9}	—	p.r.	opt.	d.k.; $\mu = 0.05$.	72-0049
		See also 1.348.						
S1.160	*N*-*tert*-butyl-acetamide	9.2	1.2×10^{7}	—	p.r.	opt.	d.k.	71-0414
S1.161	butylamine	13	$(1.1 \pm 0.1) \times 10^{6}$	—	p.r.	opt.	d.k.	73-0016
S1.162	butylammonium ion	8.5	$(2.6 \pm 0.1) \times 10^{6}$	—	p.r.	opt.	d.k.	73-0016
S1.163	carbenicillin	6.0	1.1×10^{9}	—	p.r.	opt.	d.k.	73-3020
S1.164	carbon disulfide	—	3.1×10^{10}	—	p.r.	—	—	73-1015
	$e^-_{aq} + CS_2 \rightarrow SCS^-$	*See also* 1.354.						
S1.165	carboxymethyl-cellulose ion	—	1.8×10^{7}	—	p.r.	opt.	d.k.	68-0352
S1.166	catalase	6.0	$(2.0 \pm 0.2) \times 10^{11}$	—	p.r.	opt.	d.k. (e^-_{aq}); first-order d.k. (protein) or p.b.k., $k = 18 \pm 1\ s^{-1}$.	72-1003
		See also 1.356.						
S1.167	cephaloridine	6.0	2.8×10^{10}	—	p.r.	opt.	d.k.	73-3020
S1.168	cephalosporin C	6.0	8.9×10^{9}	—	p.r.	opt.	d.k.	73-3020
S1.169	cephalothin	6.0	1.1×10^{10}	—	p.r.	opt.	d.k.	73-3020
S1.170	ceruloplasmin	6.0	$(9 \pm 1) \times 10^{10}$	—	p.r.	opt.	d.k. (e^-_{aq}); first-order $k = (8.8 \pm 0.6) \times 10^{2}\ s^{-1}$ for d.k. (protein).	72-1003
S1.171	chloral hydrate	—	$(1.2 \pm 0.2) \times 10^{10}$	—	p.r.	opt.	d.k.	73-0062
S1.172	*N*-(2-chloro-acetyl)-phenylalanine	9.2	2.3×10^{9}	—	p.r.	opt.	d.k.	73-0076
S1.173	2-chloroethanol	6.2	6.4×10^{8}	—	p.r.	opt.	d.k.; k increases with pressure → 6.4 kbar ($6.4 \times 10^{8}\ N/m^2$).	72-0298
		See also 1.366.						
S1.174	chloromethane	—	5×10^{8}	—	p.r.	opt.	d.k.	71-0587
		See also 1.367a.						
S1.175	2-chloro-2-phenyl-acetate ion	9.2	2.7×10^{9}	—	p.r.	opt.	d.k.	73-0076
S1.176	1-chloro-2-phenyl-ethane	9.2	6.0×10^{8}	—	p.r.	opt.	d.k.	73-0076
S1.177	*p*-chlorophenyl-β-D-glucopyranoside	—	2.57×10^{9}	—	p.r.	opt.	d.k.	71-0056
S1.178	5-chlorouracil	7	1.5×10^{10}	—	p.r.	opt.	d.k.; $\mu = 0.05$	72-0049
		9	6.3×10^{9}	—	p.r.	opt.	d.k.	72-0049
		11	5.5×10^{9}	—	p.r.	opt.	d.k.	72-0049
S1.179	chondroitin 4-sulfate I	—	2.6×10^{7}	—	p.r.	opt.	d.k.; rate per hexose unit.	70-3081
S1.180	chondroitin 4-sulfate II	—	1.3×10^{7}	—	p.r.	opt.	d.k.; rate per hexose unit.	70-3081
S1.181	chondroitin 6-sulfate I	—	4.2×10^{7}	—	p.r.	opt.	d.k.; rate per hexose unit.	70-3081
S1.182	chondroitin 6-sulfate II	—	1.1×10^{7}	—	p.r.	opt.	d.k.; rate per hexose unit.	70-3081
S1.183	cinnamamide	9.2	$(3.0 \pm 0.1) \times 10^{10}$	—	p.r.	opt.	d.k.	73-0072
S1.184	cloxacillin	6.0	7.5×10^{9}	—	p.r.	opt.	d.k.	73-3020
S1.185	copper oxidase (fungal laccase)	6	8.5×10^{10}	—	p.r.	opt.	d.k. at 550 nm (e^-_{aq}); contains 4 Cu(II) ions; d.k. of Cu(II) at 610 nm gave $k = 1.5 \times 10^{8}$.	71-3073 72-1003

TABLE 3. *Reactions of hydrated electrons with organic solutes* — Continued

No.	Solute and Reaction	pH	$k(dm^3mol^{-1}s^{-1})$	Ratio	Source	Method	Comment	Ref.
S1.186	*p*–cresol	7.9	$(4.2 \pm 0.5) \times 10^7$	—	p.r.	opt.	d.k.	73–0003
S1.187	cresol red	11	$(8.5 \pm 0.7) \times 10^9$	—	f.phot.	opt.	d.k.	71–0437
S1.188	*trans*–crotonate ion	9.2	$(1.3 \pm 0.1) \times 10^9$	—	p.r.	opt.	d.k.	73–0072
S1.189	*trans*–crotonic acid	1.5–3.5	$(2.9 \pm 0.4) \times 10^{10}$	—	p.r.	opt.	d.k.; also c.k.	73–0072
S1.190	cyanocobalamin (Vitamin B_{12})	6.1	$(5.2 \pm 0.1) \times 10^{10}$	—	p.r.	opt.	d.k. at 600 nm;	73–0116
		11.1	$(3.5 \pm 0.2) \times 10^{10}$				also d.k. at other wavelengths 310–520 nm.	
S1.191	cycloheptatriene	—	$(6 \pm 2) \times 10^9$	—	p.r.	opt.	d.k.	71–0710
S1.192	cystamine, di–positive ion	6.7	$(4.2 \pm 0.4) \times 10^{10}$	—	p.r.	opt.	d.k.	72–0388
	free amine	11.1	$(1.8 \pm 0.2) \times 10^{10}$	—	p.r.	opt.	d.k.	72–0388
		See also 1.388.						
S1.193	cysteamine, positive ion	5.5	3.0×10^{10} (± 10%)	—	p.r.	opt.	d.k.; pK_a = 8.6, 10.7.	73–0090
		2.4–2.65	2.4×10^{10} (cor.) (rel.)	—	γ–r.	chem.	c.k. with H^+; assume $k_{H^+} = 2.3 \times 10^{10}$.	73–0286
	negative ion	12.5	1.5×10^9 (± 10%)	—	p.r.	opt.	d.k.	73–0090
		See also 1.389.						
S1.194	cysteine, positive ion	1	6.1×10^{10} (cor.) (rel.)	—	γ–r.	chem.	c.k. with H^+; assume $k_{H^+} = 2.3 \times 10^{10}$.	73–0286
	zwitterion	5.8	1.3×10^{10} (± 10%)	—	p.r.	opt.	d.k.; pK_a = 1.8, 8.3, 10.8.	73–0090
		3	1.0×10^{10} (rel.)	—	p.r.	opt.	c.k. with H^+; assume $k_{H^+} = 2.3 \times 10^{10}$	73–0286
	negative ion	11.0	$(3.5 - 3.7) \times 10^8$	—	f.phot.	opt.	d.k.	71–7525
		12.5	2.0×10^8 (± 10%)	—	p.r.	opt.	d.k.	73–0090
		See also 1.390 – 1.392.						
S1.195	cysteine, methyl ester	5.1	1.8×10^{10} (± 10%)	—	p.r.	opt.	d.k.; pK_a = 6.5, 9.0.	73–0090
		10.1	6.9×10^9 (± 10%)					
	cysteine, *S*–methyl ether *See S*–methylcysteine (S1.319)							
S1.196	cystine, zwitterion	5.6	1.6×10^{10}	—	p.r.	opt.	d.k.	72–0187
		6.2	$(1.5 \pm 0.2) \times 10^{10}$	—	p.r.	opt.	d.k.	72–0388
		See also 1.393.						
S1.197	cystine, dianion	11.0	$(2.46 \pm 0.3) \times 10^9$	—	f.phot.	opt.	d.k.	71–7525
		12.1	$(5.0 \pm 0.5) \times 10^9$	—	p.r.	opt.	d.k.	72–0388
		See also 1.394.						
S1.198	cystine, dimethyl ester	6.3	$(5.1 \pm 0.5) \times 10^{10}$	—	p.r.	opt.	d.k.; pK_a 6.9.	72–0388
		9.2	$(2.1 \pm 0.2) \times 10^{10}$	—	p.r.	opt.	d.k.	72–0388
S1.199	cytidine	7	1.32×10^{10}	—	p.r.	opt.	d.k.; μ = 0.1;	71–0375
		14	9.5×10^9				pK_a = 12.3.	
		See also 1.395.						
S1.200	cytidine 5′–phosphate ion	7–14	6.8×10^9	—	p.r.	opt.	d.k.; μ = 0.1.	71–0375
S1.201	cytidine 2′,3′–cyclic phosphate ion	7	1.0×10^{10}	—	p.r.	opt.	d.k.; μ = 0.1;	71–0375
		14	7.5×10^9				pK_a = 12.3.	
S1.202	cytochrome–C, ferro–	7	$(1–2) \times 10^{10}$	—	p.r.	opt.	deduced that rate is similar to rate with ferri–cytochrome C; see below.	71–0327

TABLE 3. *Reactions of hydrated electrons with organic solutes* — Continued

No.	Solute and Reaction	pH	$k(dm^3mol^{-1}s^{-1})$	Ratio	Source	Method	Comment	Ref.
S1.203	cytochrome-C, ferri- $e^-_{aq} + Fe^{3+}$cyt C → Fe^{2+} cyt C	—	5.0×10^{10} (rel.)	$k/k_{nitrate} = 4.5$	γ-r.	opt.	c.k.; assume $k_{nitrate} = 1.1 \times 10^{10}$.	67-3020
		6	$\sim 2 \times 10^{10}$	—	p.r.	opt.	d.k.; soln. contains 0.1 *M* formate ion.	71-0327
		13	$\sim 1 \times 10^{10}$	—				
		6-11	$\sim (2-200) \times 10^9$ (cor.)	—	p.r.	opt.	d.k.; decreases with pH.	71-3049
		8.5	$< 1.1 \times 10^{11}$ (calcd.)	—	p.r.	opt.	d.k. as well as p.b.k.; $k_{obs.} = 3.3 \times 10^{10}$ and 2.6×10^{10}.	72-1002, 71-0930
		6.0	$(1.2 - 1.7) (\pm 0.3) \times 10^{11}$	—	p.r.	opt.	d.k.; similar values for d.k. (protein) and p.b.k.; *k* given for cyt C from several sources and several cyt C derivatives.	72-3010, 72-1003
		11	$(1.0 \pm 0.4) \times 10^{10}$	—	p.r.	opt.	d.k.	72-3010, 72-1003
		6.8	$(5.5 \pm 1.5) \times 10^{10}$	—	p.r.	opt.	d.k.; *k* is for e^- attachment; $k = 10^5 s^{-1}$ detd. for Fe(II) cyt C formn.	73-0022
		See also 1.395a.						
S1.204	cytosine	7	1.3×10^{10}	—	p.r.	opt.	d.k.; $\mu = 0.1$; $pK_a = 12.2$.	71-0375
		14	3.6×10^9					
		See also 1.396.						
S1.205	deoxyribose	7	$(1 \pm 0.5) \times 10^7$	—	p.r.	opt.	d.k.; H_2-satd.	71-0256
S1.206	2-deoxy-2-sulfonamido-D-glucose	—	1.7×10^7	—	p.r.	opt.	d.k.	70-3081
S1.207	dextran sulfate	—	$\leq 7 \times 10^6$	—	p.r.	opt.	d.k.; *k* calcd. per hexose unit.	70-3081
S1.208	diacetamide	6.5	1.1×10^{10}	—	p.r.	opt.	d.k.	73-0091
	dibenzyl ketone *See* 1,3-diphenylacetone (S1.228)							
S1.209	1,4-dicyanobenzene	—	$(2.4 \pm 0.1) \times 10^{10}$	—	p.r.	opt.	d.k.	73-0121
S1.210	*N*,*N*-diethylacetamide	9.2	8.0×10^6	—	p.r.	opt.	d.k.	71-0414
S1.211	*N*,*N*-diethylhydroxylammonium ion	4.7	$\geq 1.2 \times 10^{10}$	—	p.r.	opt.	d.k.; could be 30% higher.	71-0493
S1.212	*N*,*N*-diethylhydroxylamine	9.1	2.4×10^8	—	p.r.	opt.	d.k.; could be 30% higher.	71-0493
S1.213	*o*-difluorobenzene $e^-_{aq} + C_6H_4F_2 \rightarrow C_6H_4F + F^-$ and $\cdot C_6H_5F_2$	~6.5	1.2×10^9	—	p.r.	opt.	d.k.	73-0054
S1.214	*p*-difluorobenzene $e^-_{aq} + C_6H_4F_2 \rightarrow \cdot C_6H_4F + F^-$ and $\cdot C_6H_5F_2$	~6.5	2.0×10^9	—	p.r.	opt.	d.k.	73-0054
S1.215	*N*,*N*-dimethylacetamide	9.2	2.1×10^7	—	p.r.	opt.	d.k.	71-0414
S1.216	5,6-dimethylbenzimidazole	6.5	5.1×10^{10}	—	p.r.	opt.	d.k.	73-0116

TABLE 3. *Reactions of hydrated electrons with organic solutes* — Continued

No.	Solute and Reaction	pH	$k(dm^3mol^{-1}s^{-1})$	Ratio	Source	Method	Comment	Ref.
S1.217	4,4-dimethyl-1,1-bipyridylium ion	—	8.4×10^{10}	—	p.r.	opt.	d.k.	73-1074
S1.218	*N*,*N*-dimethylformamide	9.2	4.6×10^{8}	—	p.r.	opt.	d.k.; impurities might account for high *k*.	71-0414
		See also 1.403.						
S1.219	dimethyl fumarate	9.2	3.3×10^{10}	—	p.r.	opt.	d.k.	73-0097
S1.220	1,1-dimethylhydrazinium ion	5.6	5.8×10^{9} (± 15%)	—	p.r.	opt.	d.k.	72-0003
S1.221	1,2-dimethylhydrazinium ion	5.6	2.3×10^{9} (± 15%)	—	p.r.	opt.	d.k.	72-0003
S1.222	1,1-dimethylhydrazine	12.0	2.4×10^{7} (± 15%)	—	p.r.	opt.	d.k.	72-0003
S1.223	1,2-dimethylhydrazine	12.4	6.1×10^{6} (± 15%)	—	p.r.	opt.	d.k.	72-0003
S1.224	dimethyl maleate	9.2	3.2×10^{10}	—	p.r.	opt.	d.k.	73-0097
S1.225	2,4-dimethylphenyl-β-D-glucopyranoside	—	5.0×10^{7}	—	p.r.	opt.	d.k.	71-0056
S1.226	*N*,*N*-dimethylpivalamide	9.2	1.2×10^{7}	—	p.r.	opt.	d.k.	71-0414
S1.227	dimethylsulfoxide	—	1.6×10^{6}	—	p.r.	opt.	d.k.; cor. for $e^-_{aq} + H_2O$.	71-0587
		See also 1.405.						
S1.228	1,3-diphenylacetone (dibenzyl ketone)	~9.2	1.1×10^{10} (± 10%)	—	p.r.	opt.	d.k.	72-0171
S1.229	2,2'-dithiobisacetate ion	10.8	$(4.3 \pm 0.2) \times 10^{9}$	—	p.r.	opt.	d.k.	72-0388
S1.230	2,2'-dithiobispropionate ion	6.4	$(4.4 \pm 0.3) \times 10^{9}$	—	p.r.	opt.	d.k.	72-0388
		10.8	$(4.3 \pm 0.3) \times 10^{9}$	—	p.r.	opt.	d.k.	72-0388
S1.231	DNA	7	1.4×10^{8}	—	p.r.	opt.	d.k.; *k* per base unit.	71-0375
		—	4.0×10^{9}	—	p.r.	opt.	d.k. (e^-_{aq}) or p.b.k. (radical anion); *k* per base unit.	73-3016
		See also 1.409a.						
S1.232	dodecyl sodium sulfate	—	$\leq 2 \times 10^{5}$	—	p.r.	opt.	d.k.	71-0586
		7	$< 10^{7}$	—	p.r.	opt.	d.k.	73-3013
		See also 1.409b.						
S1.233	erythrosin (tetraiodofluorescein)	8.0	$\geq 8 \times 10^{9}$ (rel.)	—	X-r.	opt.	c.k. with O_2; contains Br^- as OH scavenger; obs. *G*(−dye); assume $k(e^-_{aq} + O_2) = 1.9 \times 10^{10}$.	71-0295, 71-0354
S1.234	ethanesulfonate ion	—	3.5×10^{7}	—	p.r.	opt.	d.k.	68-0352
S1.235	ethyl acrylate	11	8.7×10^{9} (± 15%)	—	f.phot.	opt.	d.k.; H_2-satd.	71-7345
S1.236	ethylamine	13	$(1.0 \pm 0.1) \times 10^{6}$	—	p.r.	opt.	d.k.	73-0016
S1.237	ethylammonium ion	8.5	$(2.5 \pm 0.1) \times 10^{6}$	—	p.r.	opt.	d.k.	73-0016
		See also 1.417.						
S1.238	*N*-ethylmaleamate ion	7.9	8.5×10^{9}	—	p.r.	opt.	d.k.	72-0144
S1.239	*N*-ethylmaleimide	6.0	3.8×10^{10}	—	p.r.	opt.	d.k.	72-0144
		See also 1.421a.						
S1.240	fluocinolone acetonide	—	3.0×10^{10}	—	p.r.	—	—	70-1056
S1.241	fluorenone	~9.2	3.3×10^{10} (± 10%)	—	p.r.	opt.	d.k.	72-0171

TABLE 3. *Reactions of hydrated electrons with organic solutes* — Continued

No.	Solute and Reaction	pH	k($dm^3 mol^{-1} s^{-1}$)	Ratio	Source	Method	Comment	Ref.
S1.242	fluorescein	13	$(2.0 \pm 0.2) \times 10^{10}$	—	p.r.	opt.	d.k.	67–6053
		See also 1.422.						
S1.243	fluorobenzene	~6.5	7×10^7	—	p.r.	opt.	d.k.	73–0054
	$e^-_{aq} + C_6H_5F \rightarrow (C_6H_5F)^- \rightarrow \cdot C_6H_6F$ or $C_6H_5F^- \rightarrow \cdot C_6H_5 + F^-$	*See also* 1.425.						
S1.244	5–fluorouracil	7	1.2×10^{10}	—	p.r.	opt.	d.k.; $\mu = 0.05$.	72–0049
		9	5.7×10^9					
		11	5.0×10^9					
S1.245	formamide	9.2	6.3×10^7	—	p.r.	opt.	d.k.	71–0414
		—	$(1.8 \pm 0.2) \times 10^7$	—	laser	opt.	d.k.; concn. 2.5 – 12.6 mol/dm^3.	71–0442
		6.3	1.8×10^7	—	p.r.	opt.	d.k.; k increases with pressure → 6.4 kbar (6.4×10^8 N/m^2).	72–0298
		See also 1.433.						
S1.246	formic acid	3–4	1.88×10^8 (rel.)(1)	$k/k_{H^+} = 1.20 \times 10^{-2}$	γ–r.	chem.	c.k.; $\mu = 0.05$; assume $k_{H^+} = 1.57 \times 10^{10}$ at that μ.	72–0057
	$e^-_{aq} + HCOOH \rightarrow OH^- + HCO$ (1)		1.52×10^8 (rel.)(2)	$k_2/k_1 = 0.80$				
	$e^-_{aq} + HCOOH \rightarrow H + HCOO^-$ (2)	*See also* 1.435.						
S1.247	*N*–formylglycine	10.5	2.9×10^7	—	p.r.	opt.	d.k.	71–3052
S1.249	furadantin	7	3.35×10^{10}	—	p.r.	opt.	—	73–1018
S1.250	furamazone	7	3.25×10^{10}	—	p.r.	opt.	—	73–1018
S1.251	gelatin	6.18	—	—	p.r.	opt.	d.k.; k increases by 100% at 16 → 40°C.	67–0776
		See also 1.437a.						
S1.252	D–glucuronate ion	—	2×10^6	—	p.r.	opt.	d.k.	70–3081
		See also 1.439a.						
S1.253	glutamylglutamyl–glutamic acid	6.3	2.3×10^9	—	p.r.	opt.	d.k.	74–1058
		9.6	5.8×10^8	—	p.r.	opt.	d.k.	74–1058
S1.254	glutathione, reduced (GuSH)	11.0	1.5×10^8	—	f.phot.	opt.	d.k.	71–7525
		7.2	4.5×10^9 (± 10%)	—	p.r.	opt.	d.k.; $pK_a = 2.1$, 3.6, 8.8, 9.7.	73–0090
		12.7	4.7×10^8 (± 10%)					
		See also 1.441.						
S1.255	glutathione, oxidized	11.0	$(1.15 \pm 0.1) \times 10^9$	—	f.phot.	opt.	d.k.	71–7525
		4.5–7.9	$(2.7 \pm 0.3) \times 10^9$	—	p.r.	opt.	d.k.	72–0380
	$e^-_{aq} + (GuS)_2 \rightarrow (GuS)_2^-$	6.8	$(3.4 \pm 0.3) \times 10^9$	—	p.r.	opt.	d.k.; $pK = 3.15$, 4.03, 8.57, 9.54.	72–0388
		12.6	$(2.1 \pm 0.2) \times 10^9$					
		See also 1.442.						
S1.256	glycine, positive ion	3.0	5.4×10^8 (rel.)	$k/k_{BrPhOH} = 9 \times 10^{-2}$	γ–r.	chem.	c.k.; assume $k_{BrPhOH} = 6 \times 10^9$; $pK_a = 2.35$; calcd. $k = 4 \times 10^9$ for positive ion.	72–0027
	$e^-_{aq} + {}^+NH_3CH_2COOH \rightarrow NH_3 + CH_2COOH$ + other products	4.0	4.6×10^7 (rel.)	$k/k_{BrPhOH} = 7.6 \times 10^{-3}$				
		1.0	6.0×10^9	—	p.r.	opt.	d.k.	72–0187
		2.3	4.1×10^9 (rel.)	$k/k_{H^+} = 0.18$	p.r.	opt.	c.k.; assume $k_{H^+} = 2.3 \times 10^{10}$; obs. CH_2COOH at 320 nm.	72–1012
		See also 1.443.						

TABLE 3. *Reactions of hydrated electrons with organic solutes* — Continued

No.	Solute and Reaction	pH	k(dm^{3}mol^{-1}s^{-1})	Ratio	Source	Method	Comment	Ref.
S1.257	glycine, zwitterion	6.2 7.0	8.3×10^6 9×10^6 (rel.)	— $k/k_{BrPhOH} = 1.5 \times 10^{-3}$	p.r. γ–r.	opt. chem.	d.k. d.k.; assume $k_{BrPhOH} = 6 \times 10^9$; obs. $G(Br^-)$.	71–0782 72–0027
		See also 1.444.						
S1.258	glycine, negative ion	11.8	1.7×10^6	—	p.r.	opt.	d.k.	71–0782
		See also 1.445.						
	glycine amide *See* 2–aminoacetamide (S1.115).							
S1.259	glycine anhydride	9.2	$(1.7 \pm 0.1) \times 10^9$	—	p.r.	opt.	d.k.	71–0554
	glycine methyl ester *See* methyl 2–aminoacetate (1.523, S1.318).							
	glycolamide *See* hydroxyacetamide (S1.284).							
S1.260	glycolic acid $e^-_{aq} + CH_2OHCOOH \rightarrow OH^- + CH_2OHCO$ (1) $e^-_{aq} + CH_2OHCOOH \rightarrow H + CH_2OHCOO^-$ (2)	3–4	4.27×10^8 (rel.)	$k_1/k_{H^+} = 2.72 \times 10^{-2}$ $k_2/k_1 << 0.1$	γ–r.	chem.	c.k.; $\mu = 0.05$; assume $k_{H^+} = 1.57 \times 10^{10}$ at that μ.	72–0057
S1.261	glycylglycine, zwitterion	6.4	3.7×10^8	—	p.r.	opt.	d.k.	71–3052
		See also 1.451.						
S1.262	glycylglycine, negative ion	13.1	4.9×10^7	—	p.r.	opt.	d.k.	71–3052
		See also 1.452.						
S1.263	glycylglycine	5.7	4.2×10^9	—	p.r.	opt.	d.k.	71–3052
	amide	11.4	1.7×10^9	—	p.r.	opt.	d.k.	71–3052
S1.264	glycylglycine,	5.9	4.0×10^9	—	p.r.	opt.	d.k.	71–3052
	ethyl ester	11.4	1.7×10^9	—	p.r.	opt.	d.k.	71–3052
S1.265	glycylglycyl–	5.0	1.4×10^9	—	p.r.	opt.	d.k.	74–1058
	β–alanine	12.2	2.3×10^8	—	p.r.	opt.	d.k.	74–1058
S1.266	glycylglycyl–	6.1	1.8×10^9	—	p.r.	opt.	d.k.	71–3052
	glycine, zwitterion	*See also* 1.454.						
S1.267	glycylglycyl–	10.9	3.4×10^8	—	p.r.	opt.	d.k.	71–3052
	glycine, negative ion	*See also* 1.455.						
S1.268	glycylglycyl–	5.0	7.4×10^9	—	p.r.	opt.	d.k.	71–3052
	glycine amide	11.2	1.5×10^9	—	p.r.	opt.	d.k.	71–3052
S1.269	glycylglycyl–	6.3	8.8×10^9	—	p.r.	opt.	d.k.	71–3052
	glycylglycine amide	9.7	3.7×10^9	—	p.r.	opt.	d.k.	71–3052
S1.270	glycylphenyl–	5.9	6.1×10^8	—	p.r.	opt.	d.k.	73–0076
	alanine	9.4	1.3×10^8	—	p.r.	opt.	d.k.	73–0076
		See also 1.458.						
S1.271	glycylphenyl–	5.5	1.6×10^9	—	p.r.	opt.	d.k.	73–0076
	alanylglycine	11.6	5.4×10^8	—	p.r.	opt.	d.k.	73–0076
S1.272	glycylsarcosine	6.4	6.9×10^8	—	p.r.	opt.	d.k.	74–1058
		11.3	1.0×10^8	—	p.r.	opt.	d.k.	74–1058
S1.273	glyoxylic acid $e^-_{aq} + CHOCOOH \rightarrow OH^- + CHOCO$ (1) $e^-_{aq} + CHOCOOH \rightarrow H + CHOCOO^-$ (2)	3–4	1.26×10^9 (rel.)	$k/k_{H^+} = 8.03 \times 10^{-2}$ $k_2/k_1 << 0.1$	γ–r.	chem.	c.k.; $\mu = 0.05$; assume $k_{H^+} = 1.57 \times 10^{10}$ at that μ.	72–0057
	N–(2–guanidinyl)sulfanilamide *See* sulfaguanidine (S1.404)							
S1.274	guanine	7 11	1.35×10^{10} 2.0×10^9	—	p.r.	opt.	d.k.; little change in k on addition of surfactants.	73–3013
S1.275	heme – peptide	6.0	$(1.5 \pm 0.2) \times 10^{11}$	—	p.r.	opt.	d.k.; cytochrome C deriv.	72–1003
S1.276	heparin	—	2.2×10^7	—	p.r.	opt.	d.k.; rate calcd. per hexose unit.	68–0352, 70–3081

TABLE 3. *Reactions of hydrated electrons with organic solutes* — Continued

No.	Solute and Reaction	pH	$k(dm^3mol^{-1}s^{-1})$	Ratio	Source	Method	Comment	Ref.
S1.277	heparin, *N*-de-sulfated	—	1.0×10^7	—	p.r.	opt.	d.k.; rate calcd. per hexose unit.	70-3081
S1.278	hexadecyltri-methylammonium bromide	—	$\leq 9 \times 10^5$	—	p.r.	opt.	d.k.	71-0586
		7	$< 10^7$	—	p.r.	opt.	d.k.	73-3013
		See also 1.465a.						
S1.279	hexafluorobenzene $e^-_{aq} + C_6F_6 \rightarrow \cdot C_6F_5 + F^-$	~6.5	2.0×10^{10}	—	p.r.	opt.	d.k.	73-0054
		See also 1.465c.						
S1.280	hyaluronic acid	5.2	3×10^8	—	p.r.	opt.	d.k.; per disaccharide unit (mol. wt. 400).	67-0730
		11.2	8×10^8					
		—	1.4×10^8	—	p.r.	opt.	d.k.; rate calcd. per hexose unit.	68-0352, 70-3081
		—	$(2.1 \text{ to } 6.4) \times 10^7$	—	p.r.	—	solns. contain ~ 0.07 – 0.5% protein.	72-3119
S1.281	hyaluronic acid, sulfated	—	1.7×10^7	—	p.r.	opt.	d.k.; rate calcd. per hexose unit.	70-3081
S1.282	hydrocortisone	—	3.5×10^{10}	—	p.r.	—	—	70-1056
S1.283	hydrocortisone acetate	—	3.2×10^{10}	—	p.r.	—	—	70-1056
S1.284	hydroxyacetamide	7.5	2.7×10^8	—	p.r.	opt.	d.k.	73-0071
S1.285	hydroxycyclo-heptatriene $e^-_{aq} + C_7H_8OH \rightarrow \cdot C_7H_9OH + OH^-$	—	$(6 \pm 2) \times 10^9$	—	p.r.	opt.	d.k.	71-0710
S1.286	β-*p*-hydroxy-phenylglucoside	~7	$\sim 1 \times 10^7$	—	p.r.	opt.	d.k.	71-0480
S1.287	*p*-hydroxyphenyl-propionate ion (dianion)	7.0	$(4.6 \pm 0.5) \times 10^7$	—	p.r.	opt.	d.k.; $pK_a = 4.6$, 10.1.	73-0003
		12.5	$(2.1 \pm 0.2) \times 10^7$	—	p.r.	opt.	d.k.	73-0003
		See also 1.481.						
S1.288	2-hydroxypropion-amide	9.3	1.9×10^8	—	p.r.	opt.	d.k.	73-0071
	Igepal CO-730 *See* polyoxyethylene (15) nonylphenol (S1.382).							
S1.289	indole	11	2.6×10^8	—	f.phot.	opt.	d.k.	72-0541
		See also 1.487.						
S1.290	indole-3-acetate ion	11	1.7×10^8	—	f.phot.	opt.	d.k.	72-0541
S1.291	indole-3-propion-ate ion	11	2.6×10^8	—	f.phot.	opt.	d.k.	72-0541
S1.292	iodoacetamide $e^-_{aq} + ICH_2CONH_2 \rightarrow I^- + CH_2CONH_2$	—	5×10^{10}	—	p.r.	—	estd.	69-3030
S1.293	3-iodopropionate ion	7	5.8×10^9	—	f.phot.	opt.	d.k.	70-1226
S1.294	iodotyrosine	3.0–6.0	8.2×10^9	$k/k_{H^+} = 0.355$	X-r.	opt.	c.k.; assume $k_{H^+} = 2.3 \times 10^{10}$.	72-0610
S1.295	keratan sulfate	—	3.3×10^7	—	p.r.	opt.	d.k.; rate calcd. per hexose unit.	70-3081
		—	3.0×10^7	—	p.r.	opt.	d.k.	71-0067
	laccase *See* copper oxidase (S1.186).							
	lactamide *See* 2-hydroxypropionamide (S1.288).							
S1.296	lactate ion	7.0	5.0×10^7 (rel.)	$k/k_{BrPhOH} = 8.33 \times 10^{-3}$	γ-r.	chem.	c.k.; obs. $G(Br^-)$; assume $k_{BrPhOH} = 6.0 \times 10^9$	72-0027
		See also 1.501.						

TABLE 3. *Reactions of hydrated electrons with organic solutes* — Continued

No.	Solute and Reaction	pH	k(dm^{3}mol^{-1}s^{-1})	Ratio	Source	Method	Comment	Ref.
S1.297	lactic acid e^-_{aq} + $CH_3CHOHCOOH$ → OH^- + $CH_3CHOHCO$ (1) e^-_{aq} + $CH_3CHOHCOOH$ → H + $CH_3CHOHCOO^-$ (2)	3.0	7 x 10^8 (rel.)	k/k_{BrPhOH} = 9.67 x 10^{-2}	γ–r.	chem.	c.k.; obs. $G(Br^-)$; assume k_{BrPhOH} = 6.0 x 10^9 and pK_a = 3.82 to calc. k.	72–0027
		3–4	6.31 x 10^8 (rel.)	k_1/k_{H^+} = 4.02 x 10^{-2} $k_2/k_1 << 0.1$	γ–r.	chem.	c.k.; μ = 0.05; assume k_{H^+} = 1.57 x 10^{10} at that μ.	72–0057
S1.298	lipoate ion *See also* 1.507.	7.0	(1.5 ± 0.2) x 10^{10}	—	p.r.	opt.	d.k.	72–0388
S1.299	maleate ion (monoanion)	—	1.8 x 10^{10}	—	p.r.	opt.	d.k.; calcd. from $k_{obs.}$ = 1.45 x 10^{10} at pH 5.77.	73–0097
	(dianion) *See also* 1.511 – 1.512.	10.5	1.6 x 10^9	—	p.r.	opt.	d.k.	73–0097
S1.300	malonamide	7.0	1.1 x 10^9	—	p.r.	opt.	d.k.	73–0091
S1.301	malonate ion (monoanion) e^-_{aq} + $HOOCCH_2COO^-$ → OH^- + $OCCH_2COO^-$ (1) e^-_{aq} + $HOOCCH_2COO^-$ → H + $^-OOCCH_2COO^-$ (2)	—	6 x 10^8 (rel.)	—	γ–r.	chem.	c.k.; obs. $G(Br^-)$; assume k_{BrPhOH} = 6.0 x 10^9; value calcd. from ratios at pH 2.1, 3.5, 5.1, 6.2, and 7.2 of k/k_{BrPhOH} = 0.175, 0.12, 0.065, 0.0183, and 0.002, resp.; pK_a = 2.86, 5.5.	72–0027
		3–4	6.11 x 10^8 (rel.)	k/k_{H^+} = 3.89 x 10^{-2} $k_2/k_1 \leq 0.1$	γ–r.	chem.	c.k.; μ = 0.05; assumed k_{H^+} = 1.57 x 10^{10} at that μ.	72–0057
	See also 1.513.							
S1.302	malonate ion (dianion)	—	3 x 10^6 (rel.)	—	γ–r.	chem.	c.k.; see S1.301 above.	72–0027
S1.303	malonic acid e^-_{aq} + $HOOCCH_2COOH$ → OH^- + $OCCH_2COOH$	—	1.3 x 10^9 (rel.)	—	γ–r.	chem.	c.k.; see S1.301 above.	72–0027
		3–4	1.45 x 10^9 (rel.)	k/k_{H^+} = 9.22 x 10^{-2}	γ–r.	chem.	c.k.; μ = 0.05; assumed k_{H^+} = 1.57 x 10^{10} at that μ, cor. for e^-_{aq} + anions.	72–0057
	menaquinone *See* 2–methyl–1,4–naphthoquinone (S1.333).							
	2–mercaptoacetate ion *See* thioglycolate ion (1.621, S1.416).							
S1.304	2–mercaptoethanol	1.6–3.0	5.8 x 10^{10} (rel.)	—	γ–r.	chem.	c.k. with H^+; assume k_{H^+} = 2.3 x 10^{10}.	73–0286
	See also 1.514.							
S1.304a	2–mercaptopropionate ion	7.2 12.2	5.0 x 10^9 (± 10%) 7.7 x 10^8 (± 10%)	—	p.r.	opt.	d.k.; pK_a ≅ 4, 10.7.	73–0090
S1.305	3–mercaptopropionate ion	7.4 13.0	5.0 x 10^9 (± 10%) ~ 2.8 x 10^8 (± 10%)	—	p.r.	opt.	d.k.; pK_a = 4.3, 10.3.	73–0090
S1.306	2–mercaptopropionic acid	1.6–3.0	(3.4 to 17.5) x 10^9 (rel.)	—	p.r.	opt.	c.k.; assume k_{H^+} = 2.3 x 10^{10}; k increases with pH.	73–0286
S1.307	3–mercaptopropionic acid	1.6–3.0	5.4 x 10^9 (rel.)	—	p.r.	opt.	c.k. with H^+; assume k_{H^+} = 2.3 x 10^{10}.	73–0286
	3–mercaptovaline *See* penicillamine (1.517, S1.365).							

TABLE 3. *Reactions of hydrated electrons with organic solutes* — Continued

No.	Solute and Reaction	pH	k($dm^3 mol^{-1} s^{-1}$)	Ratio	Source	Method	Comment	Ref.
S1.308	methacrylamide	9.2	$(2.4 \pm 0.3) \times 10^{10}$	—	p.r.	opt.	d.k.	73-0072
S1.309	methacrylate ion	11	3×10^9 (± 15%)	—	f.phot.	opt.	d.k.; H_2-satd.	71-7345
		9.2	$(4.5 \pm 0.2) \times 10^9$	—	p.r.	opt.	d.k.	73-0072
		See also 1.518.						
S1.310	methacrylic acid	1.5–3.5	$(2.8 \pm 0.3) \times 10^{10}$	—	p.r.	opt.	d.k.; also c.k.	73-0072
S1.311	β-methazone valerate	—	3.7×10^{10}	—	p.r.	opt.	d.k.	70-1056
S1.312	methemoglobin	6–9	$\sim 6 \times 10^9$ to $\sim 3 \times 10^{11}$ (cor.)	—	p.r.	opt.	d.k.; decreases with pH.	71-3049
		6	3.0×10^{11}	—	p.r.	opt.	d.k. (e^-_{aq}); d.k. (protein) or p.b.k., $k = (2.2 \pm 0.3) \times 10^{11}$.	72-1003
S1.313	methicillin	6.0	2.8×10^9	—	p.r.	opt.	d.k.	73-3020
S1.314	methionine	7.3	4.5×10^7 (± 10%)	—	p.r.	opt.	d.k.; pK_a = 2.3, 9.2.	73-0090
		See also 1.522.						
S1.315	methyl acrylate	11	9.4×10^9 (± 15%)	—	f.phot.	opt.	d.k.; H_2-satd.	71-7345
S1.316	2-methyladenine	7	8.4×10^9	—	p.r.	opt.	d.k.; $\mu = 0.1$;	71-0375
		11	1.0×10^9				$pK_a \sim 10$.	
S1.317	7-methyladenine	6–12	1.3×10^{10}	—	p.r.	opt.	d.k.; $\mu = 0.1$.	71-0375
S1.318	methyl 2-aminoacetate (glycine methyl ester) positive ion	11.2	3.3×10^8	—	p.r.	opt.	d.k.	71-3052
		5.3	6.8×10^9	—	p.r.	opt.	d.k.	71-3052
		See also 1.523.						
S1.319	*S*-methylcysteine	5.4	7.2×10^8 (± 10%)	—	p.r.	opt.	d.k.; $pK_a \cong$ 2, 8.8.	73-0090
		12.2	1.5×10^8 (± 10%)					
S1.320	1-methylcytosine	7–14	1.4×10^{10}	—	p.r.	opt.	d.k.; $\mu = 0.1$.	71-0375
S1.321	methylene chloride $e^-_{aq} + CH_2Cl_2 \rightarrow CH_2Cl + Cl^-$	10	$(6.3 \pm 0.5) \times 10^9$	—	p.r.	opt.	d.k.	72-0159
S1.322	methylene iodide	6–7	3.4×10^{10}	—	p.r.	opt.	d.k.	73-1041
S1.323	*N*-methylformamide	9.2	7.1×10^7	—	p.r.	opt.	d.k.	71-0414
		See also 1.530.						
S1.324	methyl fumarate (monoanion)	—	1.3×10^{10}	—	p.r.	opt.	d.k.	73-0097
	methyl glycolate *See* methyl hydroxyacetate							
S1.325	methylhydrazine	12.0	6.5×10^6 (± 15%)	—	p.r.	opt.	d.k.	72-0003
S1.326	methylhydrazinium ion	5.5	1.4×10^9 (± 15%)	—	p.r.	opt.	d.k.	72-0003
S1.327	methyl hydroxyacetate	9.0	1.4×10^9	—	p.r.	opt.	d.k.	73-0071
		See also 1.532.						
S1.328	*N*-methylhydroxylamine	9.0	2.4×10^8	—	p.r.	opt.	d.k.	71-0493
S1.329	*O*-methylhydroxylamine	9.1	4.4×10^8	—	p.r.	opt.	d.k.	71-0493
S1.330	*N*-methylhydroxylammonium ion	4.8	1.3×10^{10}	—	p.r.	opt.	d.k.	71-0493
S1.331	*O*-methylhydroxylammonium ion	4.5	$\geq 1.9 \times 10^{10}$	—	p.r.	opt.	d.k.; could be ~ 30% higher.	71-0493
S1.332	methyl methacrylate	11	6.3×10^9 (± 15%)	—	f.phot.	opt.	d.k.; H_2-satd.	71-7345
		9.2	$(1.3 \pm 0.1) \times 10^{10}$	—	p.r.	opt.	d.k.	73-0072
S1.333	2-methyl-1,4-naphthoquinone (menaquinone, Vitamin K_3) $e^-_{aq} + MQ \rightarrow MQ^-$ (semiquinone)	—	5.4×10^{10}	—	p.r.	opt.	—	72-3057, 73-0026
S1.334	methylpenicillin	6.0	2.0×10^9	—	p.r.	opt.	d.k.	73-3020

No.	Solute and Reaction	pH	k($dm^3 mol^{-1} s^{-1}$)	Ratio	Source	Method	Comment	Ref.
S1.335	*N*-methylsuccinimide	6.9	1.3×10^{10}	—	p.r.	opt.	d.k.	73-0091
S1.336	methyl thioglycolate	5.2 10.3	1.4×10^{10} (± 10%) 1.4×10^{9} (± 10%)	—	p.r.	opt.	d.k.; pK_a = 7.8.	73-0090
S1.337	metmyoglobin	6-9	~ 7×10^{9} to ~4×10^{10} (cor.)	—	p.r.	opt.	d.k.; decreases with pH.	71-3049
		6	(5.3 to 6.0)(± 0.6) $\times 10^{10}$	—	p.r.	opt.	d.k. (e^-_{aq} or protein) or p.b.k.	72-1003
S1.338	1,2-naphthoquinone-4-sulfonate ion	~9.2	1.7×10^{10} (± 10%)	—	p.r.	opt.	d.k.	72-0171
S1.339	1,4-naphthoquinone-2-sulfonate ion	~9.2	2.6×10^{10} (± 10%)	—	p.r.	opt.	d.k.	72-0171
S1.340	5-nitrobarbituric acid	5.9	1.82×10^{10}	—	p.r.	opt.	d.k.	73-1003
S1.341	nitrobenzene $e^-_{aq} + C_6H_5NO_2 \rightarrow C_6H_5NO_2^-$	—	2.8×10^{10}	—	p.r.	opt.	d.k.; k = (3.0 to 4.1) x 10^{10} and $E_a \cong 2 - 4.8$ kcal/mol (10 - 20 kJ/mol) vary with concn. of added ethanol, $MgCl_2$, KI, methanol, propanol, and butanol.	71-0580
		—	4.2×10^{10}	—	p.r.	opt.	d.k.; $\mu = 0$; k decreased in H_2O-ethanol mixtures.	73-1008
		See also 1.551.						
S1.342	nitrobenzene anion $e^-_{aq} + C_6H_5NO_2^- \rightarrow C_6H_5NO_2^{2-}$	10	2.5×10^{10}	—	p.r.	opt., condy.	p.b.k. during train of pulses (train length ~ 100 μs); computer analysis.	71-0171
S1.343	5-nitrofuraldehyde	7	3.4×10^{10}	—	p.r.	opt.	—	73-1018
S1.344	5-nitrofuraldehyde diacetate	7	3.0×10^{10}	—	p.r.	opt.	—	73-1018
S1.345	5-nitro-2-furaldehyde semicarbazone (nitrofurazone)	—	2.8×10^{10}	—	p.r.	opt.	d.k. (e^-_{aq}) or p.b.k. (radical anion).	73-3016
S1.346	*anti*-5-nitro-2-furaldoxime (NF) $e^-_{aq} + NF \rightarrow NF^-$	6.8	3.8×10^{10}	—	p.r.	opt.	d.k. at 550 nm (e^-_{aq}) or at 360 nm (NF) as well as p.b.k. at 395 nm; slight decrease in k with increase in pH (4 - 12).	73-1018
S1.347	5-nitrofuroate ion $e^-_{aq} + {}^-OOC(C_4H_2O)NO_2 \rightarrow {}^-OOC(C_4H_2O)NO_2^-$	3.3-7	2.2×10^{10}	—	p.r.	opt.	d.k.	73-0114
S1.348	nitromethane	—	2.2×10^{10}	—	p.r.	opt.	d.k.; k unchanged in sodium dodecyl sulfate soln.	73-1004
		6-7	2.9×10^{10}	—	p.r.	opt.	d.k.	73-1041
		See also 1.553.						
S1.349	nitromethane anion $e^-_{aq} + CH_3NO_2^- \rightarrow CH_3NO_2^{2-}$	10	—	—	p.r.	opt.	k has same order of magnitude as for $e^-_{aq} + CH_3NO_2 \rightarrow CH_3NO_2^-$.	71-0171
		See also 1.554.						

TABLE 3. *Reactions of hydrated electrons with organic solutes* — Continued

No.	Solute and Reaction	pH	k(dm^{3}mol^{-1}s^{-1})	Ratio	Source	Method	Comment	Ref.
S1.350	5-nitro-6-methyl-uracil	5.9	1.94×10^{10}	—	p.r.	opt.	d.k.	73-1003
S1.351	5-nitroorotic acid	5.9	1.75×10^{10}	—	p.r.	opt.	d.k.	73-1003
S1.352	*p*-nitrophenol	5.5	4.4×10^{10}	—	p.r.	opt.	d.k.; k also detd. at 6.4 kbar.	72-0102
		See also 1.559.						
S1.353	*o*-nitrophenyl-β-D-glucopyranoside	—	2.54×10^{10}	—	p.r.	opt.	d.k.	71-0056
S1.354	*p*-nitrophenyl-β-D-glucopyranoside	—	3.89×10^{10}	—	p.r.	opt.	d.k.	71-0056
		~7	$(1 - 5) \times 10^9$	—	p.r.	opt.	d.k.	71-0480
S1.355	5-nitrouracil	5.9	2.1×10^{10}	—	p.r.	opt.	d.k.	73-1003
S1.356	norpseudopelletierine N^--oxyl	—	$(2.4 \pm 0.2) \times 10^{10}$	—	p.r.	opt.	d.k.	71-0061
S1.357	oleate ion	7,11	$< 10^7$	—	p.r.	opt.	d.k.	73-3013
S1.358	oxaloacetate ion	9.5	$(4.8 \pm 0.6) \times 10^9$	—	p.r.	opt.	d.k.	73-0073
		See also 1.568.						
S1.359	oxamate ion	9.2	5.7×10^9	—	p.r.	opt.	d.k.	73-0091
		See also 1.572.						
S1.360	oxamide	9.2	2.7×10^{10}	—	p.r.	opt.	d.k.	71-0782
		9.0	3.3×10^{10}	—	p.r.	opt.	d.k.	73-0091
S1.361	2-oxoglutarate ion	9.2	$(5.5 \pm 0.8) \times 10^9$	—	p.r.	opt.	d.k.	73-0073
		See also 1.573.						
S1.362	oxomalonate ion	9.3	$(1.3 \pm 0.1) \times 10^9$	—	p.r.	opt.	d.k.	73-0073
S1.363	papain	6.4	4.1×10^{10}	—	p.r.	opt.	d.k.	72-3042
S1.364	penamecillin	6.0	4.5×10^{10}	—	p.r.	opt.	d.k.	73-3020
S1.365	penicillamine (3-mercaptovaline)	5.3	1.0×10^{10} (± 10%)	—	p.r.	opt.	d.k.; $pK_a \cong 2$, 7.9, 10.4.	73-0090
		12.0	5.6×10^8 (± 10%)					
	positive ion	1.6-3.0	1.6×10^{10} (cor.) (rel.)	—	γ-r.	chem.	c.k. with H^+; assumed $k_{H^+} = 2.3 \times 10^{10}$.	73-0286
	zwitterion	1.6-3.0	5.2×10^9 (rel.)	—	γ-r.	chem.	c.k. with H^+; assumed $k_{H^+} = 2.3 \times 10^{10}$.	73-0286
		See also 1.517.						
S1.366	penicillamine disulfide	7.0	$(1.2 \pm 0.1) \times 10^{10}$	—	p.r.	opt.	d.k.	72-0388
		12.4	$(3.5 \pm 0.4) \times 10^9$					
		7.0	7.3×10^9	—	p.r.	opt.	d.k.; obs. values are 4.5, 2.3, and 1.4 x 10^9 for pH = 8, 9, and 10, resp.; net charge changes from 0 to −2 at pH 7 → 10.	73-1073
		8.0	3.7×10^9 (cor.)					
		9.0	1.6×10^9 (cor.)					
		10.0	8×10^8 (cor.)					
S1.367	pentafluorobenzene $e^-_{aq} + C_6HF_5 \rightarrow \cdot C_6HF_4 + F^-$	~6.5	1.6×10^{10}	—	p.r.	opt.	d.k.	73-0054
		See also 1.573a.						
S1.368	phenethicillin	6.0	2.7×10^9	—	p.r.	opt.	d.k.	73-3020
S1.369	phenol	—	1.6×10^7	—	p.r.	opt.	d.k.; concn. 0.2 mol/dm^3.	71-0475
		See also 1.575.						
S1.370	phenoxide ion	—	3.7×10^5	—	p.r.	opt.	d.k.; concn. 0.19 mol/dm^3, $k = 4.0 \times 10^5$ at 2.13 mol/dm^3; contains 0.2 mol/dm^3 NaOH.	71-0475
		See also 1.576.						

TABLE 3. *Reactions of hydrated electrons with organic solutes* — Continued

No.	Solute and Reaction	pH	$k(dm^3mol^{-1}s^{-1})$	Ratio	Source	Method	Comment	Ref.
S1.371	phenoxymethyl-penicillin	6.0	2.7×10^9	—	p.r.	opt.	d.k.	73-3020
S1.372	phenylacetate ion	9.0	2.0×10^7	—	p.r.	opt.	d.k.	73-0076
		See also 1.577.						
S1.373	phenyl acetone	~9.2	1.2×10^{10} (± 10%)	—	p.r.	opt.	d.k.	72-0171
S1.374	phenylalanine	6.0-6.6	1.0×10^8	—	f.phot.	opt.	d.k.	71-7350
		6.9	1.6×10^8	—	p.r.	opt.	d.k.	73-0076
		See also 1.578.						
S1.375	phenylalanine	5.4	1.4×10^9	—	p.r.	opt.	d.k.	73-0076
	amide	9.2	1.4×10^8	—	p.r.	opt.	d.k.	73-0076
S1.376	phenylalanyl-glycylglycine	6.6	1.1×10^9	—	p.r.	opt.	d.k.	73-0076
		11.3	3.7×10^8	—	p.r.	opt.	d.k.	73-0076
S1.377	phenylglycine	9.2	3.0×10^8	—	p.r.	opt.	d.k.	73-0076
S1.378	phenyl-β-D-glucopyranoside	—	7×10^7	—	p.r.	opt.	d.k.	71-0055
		—	6.5×10^7	—	p.r.	opt.	d.k.	71-0056
		~7	$< 5 \times 10^6$	—	p.r.	opt.	d.k.	71-0480
S1.379	phthalic acid	—	4.8×10^9	—	p.r.	opt.	d.k.	73-0094
S1.380	pivalamide	9.2	1.5×10^7	—	p.r.	opt.	d.k.	71-0414
	polyadenylic acid *See* adenine polynucleotides (S1.106).							
S1.381	poly(ethylene-sulfonate ion)	—	4.3×10^7	—	p.r.	opt.	d.k.	68-0352
S1.382	polyoxyethylene-(15)-nonylphenol (Igepal CO-730)	—	$\leq 1 \times 10^6$	—	p.r.	opt.	d.k.	71-0586
		See also 1.483a.						
S1.383	polyoxyethylene sorbitan monolaurate (Tween 20)	7	$< 10^7$	—	p.r.	opt.	d.k.	73-3013
S1.384	poly(styrene-sulfonate) ion	—	3.6×10^7	—	p.r.	opt.	d.k.	68-0352
	polyuridylic acid *See* uracil polynucleotides (1.649, S1.438).							
S1.385	propionamide	9.2	5.4×10^7	—	p.r.	opt.	d.k.	71-0414
		See also 1.592.						
S1.386	propionic acid	3-4	2.2×10^7 (rel.)(1)	$k_1/k_{H^+} = 1.4 \times 10^{-3}$	γ-r.	chem.	c.k.; $\mu = 0.05$; assume $k_{H^+} = 1.57 \times 10^{10}$ at that μ.	72-0057
	$e^-_{aq} + CH_3CH_2COOH \rightarrow OH^- + CH_3CH_2CO$(1)		1.3×10^7 (rel.)(2)	$k_2/k_1 = 0.60$				
	$e^-_{aq} + CH_3CH_2COOH \rightarrow H + CH_3CH_2COO^-$ (2)							
S1.387	propylamine	13	$(1.1 \pm 0.1) \times 10^6$	—	p.r.	opt.	d.k.	73-0016
S1.388	propylammonium ion	8.5	$(2.8 \pm 0.1) \times 10^6$	—	p.r.	opt.	d.k.	73-0016
		See also 1.593a.						
S1.389	purine	7	1.6×10^{10}	—	p.r.	opt.	d.k.; $\mu = 0.1$;	71-0375
		11	8.2×10^9				$pK_a = 8.75$.	71-0375
		See also 1.595.						
S1.390	pyrene	—	1.1×10^{10}	—	p.r.	opt.	d.k. in polyoxyethylene (23) dodecanol soln.; $k = 3.3 \times 10^{10}$ in hexadecyltrimethylammonium bromide soln.; $k < 5.0 \times 10^7$ in sodium dodecyl sulfate soln.	73-1004
S1.391	pyridine $e^-_{aq} + C_5H_5N \rightarrow \cdot C_5H_5NH + OH^-$ (72-5208)	7	1.0×10^9	—	p.r.	opt.	d.k.; $k = 3.7 \times 10^9$ is also reported with no explanation for the two values.	71-0582
		See also 1.596.						

TABLE 3. *Reactions of hydrated electrons with organic solutes* — Continued

No.	Solute and Reaction	pH	$k(dm^3 mol^{-1} s^{-1})$	Ratio	Source	Method	Comment	Ref.
S1.392	Rhodamine B	13	$\sim 3 \times 10^{10}$	—	p.r.	opt.	d.k.	67–6053
S1.393	ribonuclease	6.8	4×10^9	—	p.r.	opt.	d.k.; value from graph; at 65°C $k \cong 2.5 \times 10^{10}$.	67–0776
		5.9	$(1.7 \pm 0.2) \times 10^{10}$	—	p.r.	opt.	d.k.	72–3079
		7.1	$(1.0 \pm 0.15) \times 10^{10}$	—	p.r.	opt.	d.k.	72–3079
		7.6	1.0×10^{10} (rel.)	$k/k_{oxy} = 0.53$	p.r.	opt.	c.k.; assumed $k(e^-_{aq} + O_2) = 1.9 \times 10^{10}$.	72–3079
		See also 1.604.						
S1.394	sarcosine anhydride	9.2	$(2.0 \pm 0.2) \times 10^9$	—	p.r.	opt.	d.k.	71–0554
S1.395	sarcosylglycine	5.8	8.8×10^8	—	p.r.	opt.	d.k.	74–1058
		12.2	7.7×10^7	—	p.r.	opt.	d.k.	74–1058
S1.396	selenocystine	6.0	7.6×10^9	—	p.r.	opt.	d.k.	73–1010
		11.5	3.9×10^9					
	sodium dodecyl sulfate *See* dodecyl sodium sulfate (1.409b, S1.232).							
S1.397	sorbate ion	8.9	$(5.6 \pm 0.3) \times 10^9$	—	p.r.	opt.	d.k.	73–0072
S1.398	sorbic acid	1.5–4.0	$(1.9 \pm 0.1) \times 10^{10}$	—	p.r.	opt.	d.k.; also c.k.	73–0072
S1.399	stearate ion	11	$< 10^7$	—	p.r.	opt.	d.k.	73–3013
S1.400	succinamide	7.1	2.0×10^8	—	p.r.	opt.	d.k.	73–0091
S1.401	succinate ion	—		—	γ–r.	chem.	c.k. with *p*–bromophenol assuming $k_{BrPhOH} = 6.0 \times 10^9$; obs. $G(Br^-)$ at pH 3.0, 4.0, 5.0, 6.0 and 7.5, 100 k/k_{BrPhOH} = 5.67, 4.5, 1.6, 0.25 and 0.025, resp.; $pK_a = 4.16$, 5.64.	72–0027
	(monoanion)		7×10^7 (± 20%)					
	(dianion)		7×10^5 (± 50%) (rel., calcd.)					
		See also 1.613, 1.614.						
S1.402	succinic acid	—	3.7×10^8 (± 20%) (rel., calcd.)	—	γ–r.	chem.	c.k.; see S1.401 above.	72–0027
	$e^-_{aq} + (CH_2COOH)_2 \rightarrow$ $OH^- +$ $HOOCCH_2CH_2CO$ (1)	3–4	8.56×10^7 (rel.)	$k_1/k_{H^+} = 5.45 \times 10^{-3}$ $k_2/k_1 \leq 0.1$	γ–r.	chem.	c.k.; $\mu = 0.05$; assume $k_{H^+} = 1.57 \times 10^{10}$ at that μ.	72–0057
	$e^-_{aq} + (CH_2COOH)_2$ $\rightarrow H +$ $HOOCCH_2CH_2CO_2^-$ (2)							
S1.403	succinimide	6.5	1.1×10^{10}	—	p.r.	opt.	d.k.	73–0091
		11.4	9.2×10^8	—	p.r.	opt.	d.k.	73–0091
		See also 1.615.						
S1.404	sulfaguanidine	—	8.6×10^9	—	p.r.	opt.	d.k.	73–0094
S1.405	sulfanilamide	11	$(3.5 \pm 0.5) \times 10^9$	—	f.phot.	opt.	d.k.	72–0423, 73–0015
		—	7.4×10^9	—	p.r.	opt.	d.k.	73–0094
		See also 1.615b.						
S1.406	sulfanilate ion	11	2.54×10^8	—	f.phot.	opt.	d.k.	73–0270
		See also 1.616.						
S1.407	sulfanilic acid	—	5.9×10^9	—	p.r.	opt.	d.k.	73–0094
		See also 1.616a.						
S1.408	sulfasuccidine	—	14.2×10^9	—	p.r.	opt.	d.k.	73–0094
S1.409	sulfathiazole	—	11.7×10^9	—	p.r.	opt.	d.k.	73–0094
S1.410	*p*–sulfodiphenyl–picryl hydrazyl (SDPPH)	—	5.7×10^{10} (rel.)	$k/k_{N_2O} = 6.6$	γ–r.	chem.	c.k.; assume $k(e^-_{aq} + N_2O) = 8.6 \times 10^9$; p.r. gave 6.9×10^{10}.	72–0688
S1.411	1,2,3,4–tetra–fluorobenzene	~6.5	2.6×10^{10}	—	p.r.	opt.	d.k.	73–0054
		See also 1.633b.						
	$e^-_{aq} + C_6H_2F_4 \rightarrow$ $\cdot C_6H_2F_3 + F^-$							

TABLE 3. *Reactions of hydrated electrons with organic solutes* — Continued

No.	Solute and Reaction	pH	k(dm^{3}mol^{-1}s^{-1})	Ratio	Source	Method	Comment	Ref.
S1.412	2,2,6,6–tetramethyl–4–piperidone *N*–oxyl (TAN)	7.8	$(2.2 \pm 0.2) \times 10^{10}$	—	p.r.	opt.	d.k.	71–0618
S1.413	thalamyd	—	7.4×10^9	—	p.r.	opt.	d.k.	73–0094
	4–(2–thiazolylsulfamoyl)succinanilic acid *See* sulfasuccidine (S1.408).							
	N–(2–thiazolyl)sulfanilamide *See* sulfathiazole (S1.409).							
S1.414	thiodiacetate ion	10.8	8.3×10^7 (± 10%)	—	p.r.	opt.	d.k.; pK_a = 3.3, 4.5.	73–0090
S1.415	3,3′–thiodipropionate ion	10.8	5.8×10^7 (± 10%)	—	p.r.	opt.	d.k.; p$K_a \cong 4$.	73–0090
	thioglycol *See* 2–mercaptoethanol (1.514, S1.304).							
S1.416	thioglycolate ion	6.5	5.5×10^9 (± 10%)	—	p.r.	opt.	d.k.; pK_a = 3.7, 10.3.	73–0090
		12.0	5.6×10^8 (± 10%)					
		See also 1.621.						
S1.417	thiolactate ion *See* 2–mercaptopropionate ion (S1.304a).							
S1.418	thymine, negative ion	12	3.0×10^9	—	p.r.	opt.	d.k.	72–7036
		See also 1.627.						
S1.419	thymine dimer $e^-_{aq} + T_2 \rightarrow T^- + T$	8.01	$(1.5 \pm 0.2) \times 10^{10}$	—	p.r.	opt.	d.k.	72–0309
S1.420	*p*–toluenesulfonate ion $e^-_{aq} + CH_3C_6H_4SO_3^- \rightarrow SO_4^{2-}$	6	1.3×10^9 (rel.)	$k/k_{N_2O} = 0.15$	γ–r.	opt.	c.k. with N_2O assuming $k(e^-_{aq} + N_2O) = 8.67 \times 10^9$; obs. buildup of sulfate ion.	71–0932
		See also 1.632.						
S1.421	toluidine	11	$(2.0 \pm 0.5) \times 10^7$	—	f.phot.	opt.	d.k.	72–0423
S1.422	*o*–tolyl–β–D–glucopyranoside	—	4.1×10^7	—	p.r.	opt.	d.k.	71–0056
S1.423	*m*–tolyl–β–D–glucopyranoside	—	1.4×10^8	—	p.r.	opt.	d.k.	71–0056
S1.424	*p*–tolyl–β–D–glucopyranoside	—	6.1×10^7	—	p.r.	opt.	d.k.	71–0056
S1.425	*p*–tolyl–*S*–β–D–thioglucopyranoside	—	3.9×10^9	—	p.r.	—	—	70–1056
S1.426	triamcinolone	—	3.5×10^{10}	—	p.r.	—	—	70–1056
S1.427	triamcinolone acetonide	—	3.5×10^{10}	—	p.r.	—	—	70–1056
S1.428	trimethylhydrazine	10.4	$\sim 10^8$	—	p.r.	opt.	d.k.	72–0003
S1.429	trimethylhydrazinium ion	5.4	1.3×10^{10} (± 15%)	—	p.r.	opt.	d.k.	72–0003
S1.430	trimethylphosphate $e^-_{aq} + (CH_3O)_3PO \rightarrow \cdot CH_3 + (CH_3O)_2PO_2^-$	—	2×10^5	—	p.r.	—	—	72–3008
S1.431	1,3,5–trioxane	11	$\sim 10^6$	—	f.phot.	opt.	d.k.; H_2 – satd.	71–7345
	tropylcarbinol *See* hydroxycycloheptatriene (S1.285).							
	trypaflavin *See* acriflavine (1.298a, S1.98).							
S1.432	trypsin	~7	$(3.5 \pm 0.8) \times 10^{10}$	—	p.r.	opt.	d.k. at 600 nm as well as p.b.k. at 430 nm.	71–3069
S1.433	trypsinogen	~7	$(2.5 \pm 0.5) \times 10^{10}$	—	p.r.	opt.	d.k. at 600 nm as well as p.b.k. at 430 nm.	71–3069
S1.434	tryptophan	6.0–6.6	4.3×10^8	—	f.phot.	opt.	d.k.	71–7350
		See also 1.643.						
S1.435	tyramine, positive ion	6.9	$(3.5 \pm 0.2) \times 10^8$	—	p.r.	opt.	d.k.; pK_a = 9.5, 10.8.	73–0003
	negative ion	11.2	$(5.8 \pm 0.5) \times 10^7$					

TABLE 3. *Reactions of hydrated electrons with organic solutes* — Continued

No.	Solute and Reaction	pH	$k(dm^3 mol^{-1} s^{-1})$	Ratio	Source	Method	Comment	Ref.
S1.436	tyrosine,	~ 6	1.8×10^8	—	f.phot.	opt.	d.k.	71–7350
	zwitterion	6.6	$(2.8 \pm 0.5) \times 10^8$	—	p.r.	opt.	d.k.; $pK_a = 2.2$,	73–0003
	negative ion	12.5	$(9.6 \pm 1.0) \times 10^7$				9.1, 10.1.	
		See also 1.645–6.						
S1.437	uracil	—	1.5×10^{10}	—	p.r.	opt.	d.k. (e^-_{aq}) or p.b.k. (radical anion).	73–3016
		7	1.5×10^{10}	—	p.r.	opt.	d.k.; little change in k on addition of surfactants.	73–3013
		11	3.0×10^9					
		See also 1.647–8.						
S1.438	uracil poly-nucleotides (poly U)	7	7.5×10^8	—	p.r.	opt.	d.k.; mol. wt. 2×10^5; k per base unit.	71–0375
		See also 1.649.						
S1.439	vinyl acetate	11	1.7×10^9 (± 15%)	—	f.phot.	opt.	d.k.; H_2–satd.	71–7345
S1.440	vinyl benzoate	11	7.3×10^9 (± 15%)	—	f.phot.	opt.	d.k.; H_2–satd.	71–7345
S1.441	vinyl isobutyl ether	11	$\sim 10^7$	—	f.phot.	opt.	d.k.; H_2–satd.	71–7345
S1.442	*N*–vinylpyrrolidone	11	2×10^9 (± 15%)	—	f.phot.	opt.	d.k.; H_2–satd.	71–7345
	Vitamin B_{12} *See* cyanocobalamin (S1.190).							
	Vitamin K_3 *See* 2–methyl–1,4–naphthoquinone (S1.333).							
S1.443	xylenol orange	11	$(5.2 \pm 0.4) \times 10^9$	—	f.phot.	opt.	d.k.	71–0437

Formula Index

References

660169 Logan, S.R.; Wilmot, P.B., Reaction of the hydrated electron with polychloro-compounds, CHEM. COMMUN. (16): 558-9 (1966).

667025 Airey, P.L.; Dainton, F.S., The photochemistry of aqueous solutions of Fe(II). II. Processes in acidified solutions of potassium ferrocyanide at 25°C, PROC. ROY. SOC. (LONDON) SER. A 291: 478-86 (1966).

667190 Halmann, M.; Platzner, I., The photochemistry of phosphorus compounds. IV. Photolysis of sodium hydrogen phosphate in aqueous solution, J. PHYS. CHEM. 70: 2281-6 (1966).

670239 Pruetz, W.; Sommermeyer, K., Die Rolle des hydratisierten Elektrons bei der Erzeugung von Chemilumineszenzen in waessrigen Farbstoffloesungen durch Roentgenstrahlen und Elektronenimpulse, BIOPHYSIK 4: 48-62 (1967).

670730 Balazs, E.A.; Davies, J.V.; Phillips, G.O.; Young, M.D., Transient intermediates in the radiolysis of hyaluronic acid, RADIAT. RES. 31: 243-55 (1967).

670776 Braams, R.; Ebert, M., Reactions of proteins with hydrated electrons: the effect of conformation on the reaction rate constant, INT. J. RADIAT. BIOL. 13(2): 195-7 (1967).

673020 Masuda, T.; Yamauchi, K.; Matsuda, H.; Murayama, K.; Kondo, M., The reactivity of horse heart cytochrome c with OH radicals and hydrated electrons produced in radiolysis of water, Struct. Funct. Cytochromes, Proc. Symp., 1967, Okunuki, K. (ed.), Univ. of Tokyo Press, Tokyo, 1968, p.429-40.

676053 Pruetz, W.; Land, E.J., Lichtemission von waessriger Farbstoffloesungen nach Bestrahlung mit Electronenimpulsen, BIOPHYSIK 3: 349-60 (1967).

680352 Balazs, E.A.; Davies, J.V.; Phillips, G.O.; Scheufele, D.S., Polyanions and their complexes. Part III. Reactions of heparin, hyaluronic acid, sodium poly(ethylenesulphonate), sodium poly(styrene-sulphonate), and sodium carboxymethylcellulose with hydroxyl radicals and hydrated electrons, J. CHEM. SOC. PT. C (12): 1420-3 (1968).

680593 Ogura, H., Radiolysis of hydrogen cyanide in an aqueous system. Part II. Effects of additives and reaction mechanism, BULL. CHEM. SOC. JAPAN 41(12): 2871-6 (1968).

687072 Dogliotti, L.; Hayon, E., Flash photolysis study of sulfite, thiocyanate, and thiosulfate ions in solution, J. PHYS. CHEM. 72(5): 1800-7 (1968).

690144 Ghosh-Mazumdar, A.S.; Hart, E.J., Electron pulse radiolysis of aqueous tetrachloro and tetracyano complexes of Pt^{II}, INT. J. RADIAT. PHYS. CHEM. 1: 165-76 (1969).

693030 Singh, B.B.; Kabi, A., Gamma-ray inactivation of trypsin in solution. Effects of various scavengers, PROC. NAT. INST. SCI. INDIA, PART B 35(4): 291-7 (1969).

697106 Boyle, J.W.; Ghormley, J.A.; Hochanadel, C.J.; Riley, J.F., Production of hydrated electrons by flash photolysis of liquid water with light in the first continuum, J. PHYS. CHEM. 73(9): 2886-90 (1969).

700254 Barker, G.C.; Fowles, P.; Stringer, B., Pulse radiolytic induced transient electrical conductance in liquid solutions. Part 2. Radiolysis of aqueous solutions of NO_3^-, NO_2^- and $Fe(CN)_6^{3-}$, TRANS. FARADAY SOC. 66(6): 1509-19 (1970).

700465 Kalecinski, J., The hydrated electron in reaction of aluminum with aqueous solution of alkali hydroxides, BULL. ACAD. POL. SCI. SER. SCI. CHIM. 18(5): 263-9 (1970).

700512 Barker, G.C.; Fowles, P., Pulse radiolytic induced transient electrical conductance in liquid solutions. Part 3. Radiolysis of aqueous solutions of some inorganic systems, TRANS. FARADAY SOC. 66(7): 1661-9 (1970).

701056 Davies, J.V.; Phillips, G.O.; Power, D.M.; Thomas, B., The binding of cortecosteroids with serum proteins, Paterson Laboratories Annual Report, 1970, p.45-6.

701226 Davies, J.V.; Ebert, M.; Quintiliani, M., Fast intermediate reactions sensitizing alcohol dehydrogenase to radiation, Proc. of the Second Int. Symposium on Radiosensitizing and Radioprotective Drugs, Rome, May 6-8, 1969, H. Moroson; D.S. Walker; M. Quintiliani (eds.), Barnes and Noble, Inc., New York, 1970, p.87-93.

703061 Morita, M.; Eguchi, H.; Tajima, M.; Fujimaki, M., Radiation chemistry of foods. Part IV. Measurement of reaction rates of food and biological tissue extracts with hydrated electrons, AGR. BIOL. CHEM. (TOKYO) 34(4): 547-52 (1970).

703081 Moore, J.S.; Phillips, G.O.; Davies, J.V.; Dodgson, K.S., Reactions of connective tissue and related polyanions with hydrated electrons and hydroxyl radicals, CARBOHYDRATE RES. 12: 253-60 (1970).

710038 Draganic, I.G.; Draganic, Z.D.; Holroyd, R.A.; Pulse radiolysis of aqueous cyanogen solution, J. PHYS. CHEM. 75(5): 608-12 (1971).

710055 Phillips, G.O.; Filby, W.G.; Moore, J.S.; Davies, J.V., Radiation studies of aryl glycosides. Part II. Mechanism of radiolysis of phenyl β-d-glucopyranoside in aqueous solution, CARBOHYDRATE RES. 16(1): 89-103 (1971).

710056 Phillips, G.O.; Filby, W.G.; Moore, J.S.; Davies, J.V., Radiation studies of aryl glycosides. Part III. The reactivity of aryl glucosides towards hydroxyl radicals and hydrated electrons, CARBOHYDRATE RES. 16(1): 105-111 (1971).

710061 Fielden, E.M.; Roberts, P.B., Pulse radiolysis studies of the radiosensitizer Nor-pseudopelletierine-N-oxyl (NPPN). I. Radiation chemistry, INT. J. RADIAT. BIOL. 20(4): 355-62 (1971).

710067 Jooyandeh, F.; Moore, J.S.; Morgan, R.E.; Phillips, G.O., Chemical effects of

γ-irradiation of aqueous solutions of heparin and keratan sulphate, RADIAT. RES. 45(3): 455-61 (1971).

710097 Venerable, G.D.II; Halpern, J., Pulse radiolysis of aqueous solutions of pentacyanocobaltate(II). The detection and characterization of pentacyanocobaltate(I), J. AMER. CHEM. SOC. 93(9): 2176-9 (1971).

710166 Faraggi, M.; Zehavi, D.; Anbar, M., Radiolysis of aqueous nitrate solutions, TRANS. FARADAY SOC. 67(3): 701-10 (1971).

710171 Gruenbein, W.; Henglein, A.; Stevens, G.; Beck, G., Vielfachpuls-Radiolyse: Sukzessive Anlagerung zweier hydratisierter Elektronen an Sauerstoff, Nitrobenzol und Nitromethan, BER. BUNSENGES. PHYSIK. CHEM. 75(2): 126-34 (1971).

710203 Czapski, G.; Meisel, D., The role of the reaction of e_{aq}^- with Fe^{III} in the radiation chemistry of acid aqueous solutions, INT. J. RADIAT. PHYS. CHEM. 3(1): 11-6 (1971).

710234 Baxendale, J.H.; Mulazzani, Q.G., A study of the oxidation and reduction of $Ru(NH_3)_5N_2^{2+}$ by γ- and electron pulse radiolysis, J. INORG. NUCL. CHEM. 33(3): 823-30 (1971).

710256 Fel', N.S.; Zaozerskaya, L.A.; Dolin, P.I., Pulse radiolysis studies of some nucleic acid fragments in aqueous solutions, RADIAT. EFF. 9(3-4): 145-52 (1971).

710274 Barat, F.; Gilles, L.; Hickel, B.; Lesigne, B., Transient species in the pulse radiolysis of periodate ion in neutral aqueous solutions, CHEM. COMMUN. (15): 847-8 (1971).

710295 Chrysochoos, J.; Shihabi, D.S., X-radiolysis of aqueous erythrosin, RADIAT. RES. 47: 392-401 (1971).

710311 Faraggi, M.; Feder, A.; Tendler, Y., Pulse radiolysis of lanthanides. Aqueous solutions, Proc. of the 9th Rare Earth Res. Conf. Vol. II., Sessions 1-N, Virginia Polytech Inst. and State Univ., Blacksburg, Va., Oct. 10-14, 1971, p.560-72.

710327 Land, E.J.; Swallow, A.J., One-electron reactions in biochemical systems as studied by pulse radiolysis. V. Cytochrome c, ARCH. BIOCHEM. BIOPHYS. 145: 365-72 (1971).

710332 Micic, O.; Markovic, V., Rates of hydrated electron reactions with undissociated carboxylic acids, BER. BUNSENGES. PHYSIK. CHEM. 75(7): 624 (1971).

710354 Chrysochoos, J.; Shihabi, D.S., Reactivity of hydrogen atoms and hydrated electrons toward aqueous erythrosin. X-radiolysis, J. PHYS. CHEM. 75(19): 3020-2 (1971).

710364 Venerable, G.D.II., A reactivity trend seen in the reduction of transition metal complexes by outer-sphere reactants verified for hydrated electron reactions. Pulse radiolysis studies of cobalt-III complexes, INORG. CHEM. 10(9): 1999-2001 (1971).

710375 Shragge, P.C.; Michaels, H.B.; Hunt, J.W., Factors affecting the rate of hydrated electron attack on polynucleotides, RADIAT. RES. 47: 598-611 (1971).

710407 Jezowska-Trzebiatowska, B.; Kalecinska, E.; Kalecinski, J., On the reactivity of pentacyanonitrosyl ions of transition elements towards hydrated electrons and hydroxyl radicals, BULL. ACAD. POL. SCI. SER. SCI. CHIM. 19(4): 265-75 (1971).

710414 Hayon, E.; Ibata, T.; Lichtin, N.N.; Simic, M., Sites of attack of hydroxyl radicals on amides in aqueous solution. II. The effects of branching α to carbonyl and to nitrogen, J. AMER. CHEM. SOC. 93(21): 5388-94 (1971).

710416 Schwarz, H.A., Some applications of time-dependent rate constant theory to radiation chemistry, J. CHEM. PHYS. 55(8): 3647-50 (1971).

710437 Gupta, B.L.; Hart, E.J., Radiation chemistry of some sulfonephthalein dyes, RADIAT. RES. 48(1): 8-19 (1971).

710442 Walker, D.C.; Wallace, S.C., Pulse radiolysis of formamide and formamide-water mixtures, CAN. J. CHEM. 49(10): 3398-401 (1971).

710461 Zagorski, Z.P.; Sehested, K.; Nielsen, S.O., Pulse radiolysis of aqueous alkaline sulfite solutions, J. PHYS. CHEM. 75(23): 3510-7 (1971).

710462 Peled, E.; Czapski, G., The competition for e_{aq}^- between several scavengers at high concentrations and its implications on the relevance of dry electrons in the radiation chemistry of aqueous solutions, J. PHYS. CHEM. 75(23): 3626-30 (1971).

710475 Rabani, J.; Steen, H.B.; Bugge, H.; Brustad, T., Rate constants and relative yields of solvated electrons in concentrated solutions, CHEM. COMMUN. (21): 1353-4 (1971).

710480 Fel', N.S.; Nedoborova, L.I.; Kudryashov, L.I.; Dolin, P.I.; Kochetkov, N.K., Radiolysis of aqueous solutions of aromatic glucosides, HIGH ENERGY CHEM. 5(3): 215-20 (1971) (translated from KHIM. VYS. ENERG. 5(3): 241-6 (1971)).

710493 Simic, M.; Hayon, E., Intermediates produced from the one-electron oxidation and reduction of hydroxylamines. Acid-base properties of the amino, hydroxyamino, and methoxyamino radicals, J. AMER. CHEM. SOC. 93(23): 5982-6 (1971).

710554 Hayon, E.; Simic, M., Pulse radiolysis study of cyclic peptides in aqueous solution. Absorption spectrum of the peptide radical -NHCHCO-, J. AMER. CHEM. SOC. 93(25): 6781-6 (1971).

710580 Cercek, B., Effect of the structure of water on the activation energies of reactions of the hydrated electron. I. Effects of aliphatic alcohols, $MgCl_2$ and KI as co-solutes, INT. J. RADIAT. PHYS. CHEM. 3(3): 231-7 (1971).

710582 Simic, M.; Ebert, M., Pulse radiolysis of aqueous solutions of carboxy, carbamido and pyridyl derivatives of pyridine, INT. J. RADIAT. PHYS. CHEM. 3(3): 259-72 (1971), (contains rates listed in NSRDS-NBS 43 as unpublished data, 700411).

710586 Bansal, K.M.; Patterson, L.K.; Fendler, E.J.; Fendler, J.H., Reactions of hydrated electrons, hydrogen atoms and hydroxyl radicals in micellar systems, INT. J. RADIAT. PHYS. CHEM. 3(3): 321-31 (1971).

710587 Koulkes-Pujo, A.M.; Michael, B.D.; Hart, E.J., Scavenger studies of electron pulse irradiated solutions at hydrated electron half lives in the range 35-0.35 nanoseconds, INT. J. RADIAT. PHYS. CHEM. 3(3): 333-44 (1971).

710618 Willson, R.L., Pulse radiolysis studies on reaction of triacetoneamine-N-oxyl with radiation-induced free radicals, TRANS. FARADAY SOC. 67(10): 3008-19 (1971).

710619 Willson, R.L., Pulse radiolysis studies of electron transfer in aqueous quinone solutions, TRANS. FARADAY SOC. 67(10): 3020-9 (1971).

710710 Schoeneshoefer, M., Pulse radiolysis of the tropylium-ion, tropylcarbinol and tropilidene in aqueous solution, Z. NATURFORSCH. PT. B 26(11): 1120-4 (1971).

710782 Hayon, E.; Simic, M., Free radical intermediates produced in the pulse radiolysis of simple peptides in aqueous solution, INTRA-SCI-CHEM. REP. 5(4): 357-69 (1971).

710930 Nilsson, K.; Pagsberg, P., The reduction of ferricytochrome c to ferrocytochrome c studied by pulse radiolysis, Proc. of the Third Tihany Symposium on Radiation Chemistry, Vol. 2, J. Dobo and P. Hedvig (eds.), Akademiai Kiado, Budapest, Hungary, 1972, p.1311-7.

710932 Makarotshkina, L.M.; Filippov, M.T.; Dzhagatspanyan, R.V., Radiolysis of aqueous solutions of paratoluene sulphonic acid, *Ibid.* p.1333-44.

713049 Wilting, J.; Nauta, H.; Braams, R., Reaction rate constant of hydrated electron with some hemoproteins as a function of pH, FEBS (FED. EUR. BIOCHEM. SOC.) LETT. 16(2): 147-51 (1971).

713052 Simic, M.; Hayon, E., Reductive deamination of oligopeptides by solvated electrons in aqueous solution, RADIAT. RES. 48(2): 244-55 (1971).

713064 Faraggi, M.; Pecht, I., Reaction of pseudomonas azurin with hydrated electrons, BIOCHEM. BIOPHYS. RES. COMMUN. 45(4): 842-8 (1971).

713069 Masuda, T.; Ovadia, J.; Grossweiner, L.I., The pulse radiolysis and inactivation of trypsin, INT. J. RADIAT. BIOL. 20(5): 447-59 (1971).

713073 Pecht, I.; Faraggi, M., Reduction of copper(II) in fungal laccase by hydrated electrons, NATURE (LONDON) NEW BIOL. 233(38): 116-8 (1971).

717345 Moorthy, P.N.; Kumar, V.; Rao, K.N.; Shankar, J., Rate constants of reactions of photogenerated solvated electrons with monomers, RADIAT. EFF. 10(1-2): 129-31 (1971).

717350 Finnstroem, B., The kinetics of the reaction between the hydrated electron and amino acids studied by flash photolysis, PHOTOCHEM. PHOTOBIOL. 13(4): 375-7 (1971).

717393 Barker, G.C., Electrochemical effects produced by light-induced electron emission, BER. BUNSENGES. PHYSIK. CHEM. 75(8): 728-36 (1971).

717395 Crawford, M.; Rumfeldt, R., The effect of SF_6 and N_2O on the 2537 A photolysis of aqueous I^- and $Fe(CN)_6^{4-}$, CAN. J. CHEM. 49(2): 3336-41 (1971).

717525 Lal, M., Flash photolysis of sulphydryl and disulphide compounds in aqueous solution and the rate constants of their reactions with hydrated electrons (e_{aq}^-), INDIAN J. CHEM. 9(10): 1108-10 (1971).

720003 Hayon, E.; Simic, M., Intermediates produced from the one-electron oxidation of hydrazine. Evidence for the formation and decay of tetrazane and triazene, J. AMER. CHEM. SOC. 94(1): 42-7 (1972).

720013 Boyd, A.W.; Willis, C.; Lalor, G.C., Isotope effects and hydrogen yields in the radiolysis of H_2O-D_2O mixtures at very high dose rates, CAN. J. CHEM. 50(1): 83-92 (1972).

720017 Barat, F.; Gilles, L.; Hickel, B.; Lesigne, B., Pulsed radiolysis and flash photolysis of iodates in aqueous solution, J. PHYS. CHEM. 76(3): 302-7 (1972).

720027 Peter, F.A.; Neta, P., The effect of ionic dissociation of organic compounds on their rate of reaction with hydrated electrons, J. PHYS. CHEM. 76(5): 630-5 (1972).

720049 Patterson, L.K.; Bansal, K.M., Pulse radiolysis studies of 5-halouracils in aqueous solutions, J. PHYS. CHEM. 76(17): 2392-9 (1972).

720057 Micic, O.I.; Markovic, V., Rates of hydrated electron reactions with undissociated carboxylic acids, INT. J. RADIAT. PHYS. CHEM. 4(1): 43-9 (1972).

720066 Faraggi, M.; Feder, A., Pulse radiolysis studies in lanthanide aqueous solutions. II. Formation, spectrum, and some chemical properties of praseodymium(IV) in aqueous solution, J. CHEM. PHYS. 56(7): 3294-7 (1972).

720102 Hentz, R.R.; Farhataziz; Hansen, E.M., Pulse radiolysis of liquids at high pressures. II. Diffusion-controlled reactions of the hydrated electron, J. CHEM. PHYS. 56(9): 4485-8 (1972).

720144 Hayon, E.; Simic, M., Radiation sensitization reactions of N-ethylmaleimide with model compounds, RADIAT. RES. 50(3): 464-78 (1972).

720159 Balkas, T.I., The radiolysis of aqueous solutions of methylene chloride, INT. J. RADIAT. PHYS. CHEM. 4(2): 199-208 (1972).

720171 Hayon, E.; Ibata, Y.; Lichtin, N.N.; Simic, M., Electron and hydrogen atom attachment to aromatic carbonyl compounds in aqueous solution. Absorption spectra and dissociation constants of ketyl radicals, J. PHYS. CHEM. 76(15): 2072-8 (1972).

720187 Hayon, E., Reaction rates of electrons in picosecond pulse radiolysis, NATURE PHYS. SCI. 238(83): 76-7 (1972).

720266 Schoeneshoefer, M., Pulsradiolytische Untersuchung zur Oxidation der Ascorbinsaeure durch OH-Radikale und Halogen-Radikal-Komplexe in waessriger Loesung, Z. NATURFORSCH. PT. B 27(6): 649-59 (1972).

720289 Christensen, H., Pulse radiolysis of aqueous solutions of aniline and substituted anilines, INT. J. RADIAT. PHYS. CHEM. 4(3): 311-33 (1972).

720298 Hentz, R.R.; Farhataziz; Hansen, E.M., Pulse radiolysis of liquids at high pressures. III. Hydrated-electron reactions not controlled by diffusion, J. CHEM. PHYS. 57(7): 2959-63 (1972).

720301 Buxton, G.V.; Subhani, M.S., Radiation chemistry and photochemistry of oxychlorine ions. Part 1.

Radiolysis of aqueous solutions of hypochlorite and chlorite ions, J. CHEM. SOC. FARADAY TRANS. I 68(5): 947–57 (1972).

720309 Santus, R.; Helene, C.; Ovadia, J.; Grossweiner, L.I., Splitting of thymine dimer by hydrated electrons, PHOTOCHEM. PHOTOBIOL. 16(1): 65–7 (1972).

720340 Hoffman, M.Z.; Simic, M., Ligand–to–metal intramolecular electron transfer in the reduction of p–nitrobenzoatopentaammine–cobalt(III) ion, J. AMER. CHEM. SOC. 94(5): 1757–9 (1972).

720359 Nelson, D.A.; Hayon, E., Ketyl radicals of benzoylpyridines, J. PHYS. CHEM. 76(22): 3200–7 (1972).

720380 Shafferman, A., The free–radical cleavage of the disulfide bond (studied by pulse radiolysis), ISRAEL J. CHEM. 10(3): 725–33 (1972).

720381 Baxendale, J.H.; Fiti, M., Transient species in the reactions of some pyridyl complex ions with hydrated electrons, J. CHEM. SOC. DALTON TRANS. (18): 1995–8 (1972).

720388 Hoffman, M.Z.; Hayon, E., One–electron reduction of the disulfide linkage in aqueous solution. Formation, protonation, and decay kinetics of the $RSSR^-$ radical, J. AMER. CHEM. SOC. 94(23): 7950–7 (1972).

720391 Hulme, B.E.; Land, E.J.; Phillips, G.O., Pulse radiolysis of 9,10–anthraquinones. Part 1. Radicals, J. CHEM. SOC. FARADAY TRANS. I 68(10): 1992–2002 (1972).

720423 Bhattacharyya, P.K.; Saini, R.D., Reactivity of substituted aniline derivatives with hydrated electron, BARC–586, 1972, 11p.

720430 Gopinathan, C.; Damle, P.S.; Hart, E.J., γ–Ray irradiated sodium chloride as a source of hydrated electrons, J. PHYS. CHEM. 76(25): 3694–8 (1972).

720437 Pikaev, A.K., Zhestkova, T.P.; Sibirskaya, G.K., Solvated electrons in irradiated concentrated alkaline methanol and water–methanol mixtures, J. PHYS. CHEM. 76(25): 3765–71 (1972).

720460 Lati, J.; Meyerstein, D., Trivalent nickel. I. A pulse radiolytic study of the formation and decomposition of the ammoniacal complex in aqueous solution, INORG. CHEM. 11(10): 2393–7 (1972).

720462 Martin, J.E.; Hart, E.J.; Adamson, A.W.; Gafney, H.; Halpern, J., Chemiluminescence from the reaction of the hydrated electron with tris(bipyridyl)ruthenium(III), J. AMER. CHEM. SOC. 94(26): 9238–40 (1972).

720475 Zhestkova, T.P.; Pikaev, A.K.; Spitsyn, V.N., Pulse radiolysis of concentrated aqueous solutions of potassium thiocyanate, DOKL. PHYS. CHEM., PROC. ACAD. SCI. USSR 204(4–6): 482–5 (1972) (translated from DOKL. ACAD. NAUK SSSR 204(5): 1147–50 (1972)).

720541 Shetiya, R.S.; Rao, K.N.; Shankar, J., Determination of rate constants for the reactions of H, OH and e_{aq}^- with indole–3–acetic acid and other plant hormones, RADIAT. EFF. 14(3–4): 185–9 (1972).

720555 Kabakchi, S.A.; Shubin, V.N., Kinetics of the hydrated electron disappearance in concentrated aqueous alkali solutions, RADIAT. EFF. 15(1–2): 23–9 (1972).

720610 Stelter, L.H., Chemical effects of direct and indirect interactions of X–radiation with iodine containing amino acids, Ph.D., Thesis, Univ. of Toledo, Ohio, 1972, 115p.

720611 Kabachia, V.K., Pulse radiolysis studies on aqueous solutions of inorganic sulphur compounds, Ph.D., Thesis, Univ. of Saskatchewan, Saskatoon, Can., 1972, 175p.

720688 Matus, L.; Putirszkaja, G.V., Interaction of a stable free radical and solvated electron, MAGY. KEM. FOLY. 78(8): 420–3 (1972).

721002 Nilsson, K., The reduction of ferricytochrome c studied by pulse radiolysis, ISRAEL J. CHEM. 10(6): 1011–9 (1972).

721003 Faraggi, M.; Pecht, I., Elementary steps in the action of electron transfer protein, ISRAEL J. CHEM. 10(6): 1021–39 (1972).

721012 Neta, P.; Simic, M.; Hayon, E., On the pK_a of the $^+H_3NCHCOOH$ radical, J. PHYS. CHEM. 76: 3507–8 (1972).

723008 Sonntag, C.v.; Ansorge, G.; Sugimori, A.; Omori, T.; Koltzenburg, G.; Schulte–Frohlinde, D., Alkyl phosphate cleavage of aliphatic phosphates induced by hydrated electrons and by OH radicals, Z. NATURFORSCH. PT. B 27(4): 471–2 (1972).

723010 Pecht, I.; Faraggi, M., Electron transfer to ferricytochrome c: Reaction with hydrated electrons and conformational transitions involved, PROC. NAT. ACAD. SCI. U.S. 69(4): 902–6 (1972).

723042 Clement, J.R.; Armstrong, D.A.; Klassen, N.V.; Gillis, H.A., Pulse radiolysis of aqueous papain, CAN. J. CHEM. 50(17): 2833–40 (1972).

723057 Simic, M.; Hayon, E., A model of radiation sensitization by quinones, INT. J. RADIAT. BIOL. 22(5): 507–11 (1972).

723079 Lichtin, N.N.; Ogdan, J.; Stein, G., Fast consecutive radical processes within the ribonuclease molecule in aqueous solution. II. Reaction with OH radicals and hydrated electrons, BIOCHIM. BIOPHYS. ACTA 276(1): 124–42 (1972).

723119 Davies, J.V.; Edwards, H.; Moore, J.S.; Phillips, G.O., Pulse radiolysis of hyaluronic acid, Paterson Laboratories Annual Report, 1972, p.19.

725050 Behar, D.; Fessenden, R.W., Electron spin resonance studies of inorganic radicals in irradiated aqueous solutions. II. Radical trapping with nitromethane, J. PHYS. CHEM. 76(12): 1710–21 (1972).

725208 Neta, P., Electron spin resonance study of radicals produced by one–electron reduction of pyridines, RADIAT. RES. 52(3): 471–80 (1972).

727008 Hayon, E.; Treinin, A.; Wilf, J., Electronic spectra, photochemistry, and autoxidation mechanism of the sulfite–bisulfite–pyrosulfite systems. The SO_2^-, SO_3^-, SO_4^-, and SO_5^- radicals, J. AMER. CHEM. SOC. 94(1): 47–57 (1972).

727036 Whillans, D.W.; Johns, H.E., Photoreactions in aqueous solutions of thymine, pH 12, J. PHYS. CHEM. 76(4): 489–93 (1972).

727158 Basco, N.; Kenney–Wallace, G.A.; Vidyarthi, S.K.; Walker, D.C., A transient intermediate in the bimolecular reaction of hydrated electrons, CAN. J. CHEM. 50(13): 2059–70 (1972).

730002 Bansal, K.M.; Patterson, L.K., To Be Published.

730003 Feitelson, J.; Hayon, E., Electron ejection and electron capture by phenolic compounds, J. PHYS. CHEM. 77(1): 10–5 (1973).

730015 Bhattacharyya, P.K., Saini, R.D., Radiolytic yields $G(HNO_2)$ and $G(H_2O_2)$ in the aqueous nitric acid system, INT. J. RADIAT. PHYS. CHEM. 5(1): 91–9 (1973).

730016 Getoff, N.; Schwoerer, F., Pulse radiolysis of ethyl, n–propyl, n–butyl and n–amyl amine in aqueous solutions, INT. J. RADIAT. PHYS. CHEM. 5(1): 101–11 (1973).

730022 Lichtin, N.N.; Shafferman, A.; Stein, G., Reaction of hydrated electrons with ferricytochrome c. SCIENCE 179: 680–2 (1973).

730026 Hayon, E.; Simic, M., Addition of hydroxyl radicals to pyrimidine bases and electron transfer reactions of intermediates to quinones, J. AMER. CHEM. SOC. 95(4): 1029–35 (1973).

730030 Anbar, M.; Bambenek, M.; Ross, A.B. NSRDS–NBS–43, May 1973, 59p.

730043 Nazhat, N.B.; Asmus, K.–D., Reduction of mercuric chloride by hydrated electrons and reducing radicals in aqueous solutions. Formation and reactions of HgCl, J. PHYS. CHEM. 77(5): 614–20 (1973).

730054 Koester, R.; Asmus, K.–D., Reactions of fluorinated benzenes with hydrated electrons and hydroxyl radicals in aqueous solutions, J. PHYS. CHEM. 77(6): 749–55 (1973).

730062 Eriksen, T.; Henglein, A.; Stockhausen, K., Pulse radiolytic oxidation of chloral hydrate in oxygenated and deoxygenated aqueous solutions, J. CHEM. SOC. FARADAY TRANS. I 69(2): 337–45 (1973).

730071 Bell, J.; Grunwald, E.; Hayon, E., To Be Published.

730072 Hayon, E.; Lichtin, N.N.; Madhavan, V., To Be Published.

730073 Rao, P.S.; Hayon, E., To Be Published.

730076 Mittal, J.P.; Hayon, E., To Be Published.

730089 Christensen, H.C.; Sehested, K.; Hart, E.J., Formation of benzyl radicals by pulse radiolysis of toluene in aqueous solutions, J. PHYS. CHEM. 77(8): 983–7 (1973).

730090 Hoffman, M.Z.; Hayon, E., Pulse radiolysis study of sulfhydryl compounds in aqueous solution, J. PHYS. CHEM. 77(8): 990–6 (1973).

730091 Simic, M.; Hayon, E., Interaction of solvated electrons with the amide and imide groups. Acid–base properties of $RC(OH)NH_2$ radicals, J. PHYS. CHEM. 77(8): 996–1001 (1973).

730094 Phillips, G.O.; Power, D.M.; Sewart, M.C.G., Effects of γ–irradiation on sulphonamides, RADIAT. RES. 53(2): 204–15 (1973).

730097 Hayon, E.; Simic, M., Acid–base properties of radical anions of cis and trans isomers. I. Fumarates and maleates, J. AMER. CHEM. SOC. 95(8): 2433–9 (1973).

730106 Olsen, K.J.; Sehested, K.; Appelman, E.H., Pulse–radiolysis of aqueous $KBrO_4$ solutions, CHEM. PHYS. LETT. 19(2): 213–4 (1973).

730107 Faraggi, M.; Feder, A., Electron–transfer reactions of cobalt(III) and ruthenium(III) ammines with europium(II), ytterbium(II), and samarium(II) in aqueous solutions, INORG. CHEM. 12(1): 236–41 (1973).

730114 Greenstock, C.L.; Dunlop, I.; Neta, P., Radiation chemical studies of the oxidation and reduction of nitrofurans. Oxidative denitration by OH radicals, J. PHYS. CHEM. 77(9): 1187–90 (1973).

730116 Faraggi, M.; Leopold, J.G., The reduction of cobalamin. A pulse radiolysis study, BIOCHEM. BIOPHYS. RES. COMMUN. 50(2): 413–20 (1973).

730121 Robinson, E.A.; Schulte–Frohlinde, D., Pulse radiolysis of 1,4–dicyanobenzene in aqueous solutions in the presence and absence of thallium(I) ions, J. CHEM. SOC. FARADAY TRANS. I 69(4): 707–18 (1973).

730134 Phillips, G.O.; Power, D.M.; Robinson, C., Chemical changes following γ–irradiation of benzylpenicillin in aqueous solution, J. CHEM. SOC. PERKIN TRANS. II (5): 575–82 (1973).

730270 Murthy, R.N.; Rao, K.N., Determination of rate constants for the reaction of H, OH, and e^-_{aq} with sulphanilic acid in aqueous solutions. RADIAT. EFF. 18(1–2): 35–8 (1973).

730286 Tung, T.–L.; Kuntz, R.R., Hydrated electron reactions with thiols in acidic aqueous solutions, RADIAT. RES. 55(2): 256–64 (1973).

731003 Neta, P.; Greenstock, C.L., Electron spin resonance and pulse radiolysis studies of irradiated aqueous solutions of 5–nitrouracils. Oxidative denitration by OH radicals, RADIAT. RES. 54(1): 35–48 (1973).

731004 Wallace, S.C.; Thomas, J.K., Reactions in micellar systems, RADIAT. RES. 54(1): 49–62 (1973).

731008 Barat, F.; Gilles, L.; Hickel, B.; Lesigne, B., Effect of the dielectric constant on the reactivity of the solvated electron, J. PHYS. CHEM. 77(13): 1711–5 (1973).

731010 Tamba, M.; Badiello, R., Pulse– and gamma–radiolysis of selenium containing compounds: selenocystine, INT. J. RADIAT. BIOL. 23(5): 435–45 (1973).

731012 Eager, R.L.; Kabachia, V.; Waltz, W.L.; Woods, R.J.; McCallum, K.J., Reaction of the hydrated electron with HS^-, CAN. J. CHEM. 51(12): 1920–2 (1973).

731015 Roebke, W.; Schoeneshoefer, M.; Henglein, A., The γ–radiolysis and pulse radiolysis of carbon disulfide in aqueous solution, Z. NATURFORSCH. PT. B 28(1–2): 12–22 (1973).

731018 Greenstock, C.L.; Dunlop, I., Pulse radiolysis studies of nitrofurans. Radiation chemistry of

nifuroxime, J. PHYS. CHEM. 77(15): 1834–8 (1973).

731027 Schoeneshoefer, M., Pulsradiolytische Untersuchung ueber das $S_4O_6^{3-}$–Radikal als Zwischenprodukt der Thiosulfatoxidation und Tetrathionatreduktion, INT. J. RADIAT. PHYS. CHEM. 5(4): 375–86 (1973).

731041 Graetzel, M.; Thomas, J.K., Unpublished data.

731049 Grabner, G.; Getoff, N.; Schwoerer, F., Pulsradiolyse von H_3PO_4, $H_2PO_4^-$, HPO_4^{2-} und $P_2O_7^{4-}$ in waessriger Loesung. I. Geschwindigkeitskonstanten der Reaktionen mit den Primaerprodukten der Waesserradiolyse, INT. J. RADIAT. PHYS. CHEM. 5(5): 393–403 (1973).

731073 Purdie, J.W.; Gillis, H.A.; Klassen, N.V., The pulse radiolysis of penicillamine and penicillamine disulfide in aqueous solution, CAN. J. CHEM. 51(18): 3132–42 (1973).

731074 Farrington, J.A.; Ebert, M.; Land, E.J.; Fletcher, K., Bipyridyllium quaternary salts and related compounds. V. Pulse radiolysis studies of the reaction of paraquat radical with oxygen. Implications for the mode of action of bipyridyl herbicides, BIOCHIM. BIOPHYS. ACTA 314(22): 372–81 (1973).

733012 Yamamoto, O., Radiation–induced binding of nucleic acid constituents with protein constituents and with each other, INT. J. RADIAT. PHYS. CHEM. 5(2): 213–29 (1973).

733013 Greenstock, C.L.; Dunlop, I., Hydrated electron reactions with nucleic acid bases in micellar systems, INT. J. RADIAT. PHYS. CHEM. 5(2): 231–3 (1973).

733016 Chapman, J.D.; Greenstock, C.L.; Reuvers, A.P., McDonald, E.; Dunlop, I., Radiation chemical studies with nitrofurazone as related to its mechanism of radiosensitization, RADIAT. RES. 53(2): 190–203 (1973).

733020 Phillips, G.O.; Power, D.M.; Robinson, C.; Davies, J.V., Interactions of bovine serum albumin with penicillins and cephalosporins studied by pulse radiolysis, BIOCHIM. BIOPHYS. ACTA 295(1): 8–17 (1973).

741058 Rao, P.S.; Hayon, E., Interaction of hydrated electrons with the peptide linkage, J. PHYS. CHEM. 78(12): 1193–6 (1974).

NBS-114A (REV. 7-73)

U.S. DEPT. OF COMM. BIBLIOGRAPHIC DATA SHEET	1. PUBLICATION OR REPORT NO. NSRDS-NBS 43, Suppl.	2. Gov't Accession No.	3. Recipient's Accession No.

4. TITLE AND SUBTITLE

Selected Specific Rates of Reactions of Transients from Water in Aqueous Solution. Hydrated Electron, Supplemental Data

5. Publication Date: June 1975

6. Performing Organization Code

7. AUTHOR(S): Alberta B. Ross

8. Performing Organ. Report No.

9. PERFORMING ORGANIZATION NAME AND ADDRESS

NATIONAL BUREAU OF STANDARDS
DEPARTMENT OF COMMERCE
WASHINGTON, D.C. 20234

10. Project/Task/Work Unit No.

11. Contract/Grant No.

12. Sponsoring Organization Name and Complete Address *(Street, City, State, ZIP)*

Atomic Energy Commission and National Bureau of Standards

13. Type of Report & Period Covered: N/A

14. Sponsoring Agency Code

15. SUPPLEMENTARY NOTES

Library of Congress Catalog Card Number: 72-600064

16. ABSTRACT *(A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here.)*

A compilation of rates of reactions of hydrated electrons with other transients and with organic and inorganic solutes in aqueous solution appeared in NSRDS-NBS 43, and covered the literature up to early 1971. This supplement includes additional rates which have been published through July 1973.

17. KEY WORDS *(six to twelve entries; alphabetical order; capitalize only the first letter of the first key word unless a proper name; separated by semicolons)*

Aqueous solution; chemical kinetics; data compilation; hydrated electron; radiation chemistry; rates.

18. AVAILABILITY

[X] Unlimited

[ ] For Official Distribution. Do Not Release to NTIS

[ ] Order From Sup. of Doc., U.S. Government Printing Office Washington, D.C. 20402, SD Cat. No. C13, 48:43, Suppl.

[ ] Order From National Technical Information Service (NTIS) Springfield, Virginia 22151

19. SECURITY CLASS (THIS REPORT): UNCLASSIFIED

21. NO. OF PAGES: 43

20. SECURITY CLASS (THIS PAGE): UNCLASSIFIED

22. Price

Announcement of New Publications in
National Standard Reference Data Series

Superintendent of Documents,
Government Printing Office,
Washington, D.C. 20402

Dear Sir:

Please add my name to the announcement list of new publications to be issued in the series: National Standard Reference Data Series—National Bureau of Standards:

Name_____

Company_____

Address_____

City_____ State_____ Zip Code_____

(Notification key N-337)

NBS TECHNICAL PUBLICATIONS

PERIODICALS

JOURNAL OF RESEARCH reports National Bureau of Standards research and development in physics, mathematics, and chemistry. It is published in two sections, available separately:

• **Physics and Chemistry (Section A)**

Papers of interest primarily to scientists working in these fields. This section covers a broad range of physical and chemical research, with major emphasis on standards of physical measurement, fundamental constants, and properties of matter. Issued six times a year. Annual subscription: Domestic, $17.00; Foreign, $21.25.

• **Mathematical Sciences (Section B)**

Studies and compilations designed mainly for the mathematician and theoretical physicist. Topics in mathematical statistics, theory of experiment design, numerical analysis, theoretical physics and chemistry, logical design and programming of computers and computer systems. Short numerical tables. Issued quarterly. Annual subscription: Domestic, $9.00; Foreign, $11.25.

DIMENSIONS/NBS (formerly Technical News Bulletin)—This monthly magazine is published to inform scientists, engineers, businessmen, industry, teachers, students, and consumers of the latest advances in science and technology, with primary emphasis on the work at NBS. The magazine highlights and reviews such issues as energy research, fire protection, building technology, metric conversion, pollution abatement, health and safety, and consumer product performance. In addition, it reports the results of Bureau programs in measurement standards and techniques, properties of matter and materials, engineering standards and services, instrumentation, and automatic data processing.

Annual subscription: Domestic, $9.45; Foreign, $11.85.

NONPERIODICALS

Monographs—Major contributions to the technical literature on various subjects related to the Bureau's scientific and technical activities.

Handbooks—Recommended codes of engineering and industrial practice (including safety codes) developed in cooperation with interested industries, professional organizations, and regulatory bodies.

Special Publications—Include proceedings of conferences sponsored by NBS, NBS annual reports, and other special publications appropriate to this grouping such as wall charts, pocket cards, and bibliographies.

Applied Mathematics Series—Mathematical tables, manuals, and studies of special interest to physicists, engineers, chemists, biologists, mathematicians, computer programmers, and others engaged in scientific and technical work.

National Standard Reference Data Series—Provides quantitative data on the physical and chemical properties of materials, compiled from the world's literature and critically evaluated. Developed under a world-wide program coordinated by NBS. Program under authority of National Standard Data Act (Public Law 90-396).

NOTE: At present the principal publication outlet for these data is the Journal of Physical and Chemical Reference Data (JPCRD) published quarterly for NBS by the American Chemical Society (ACS) and the American Institute of Physics (AIP). Subscriptions, reprints, and supplements available from ACS, 1155 Sixteenth St. N. W., Wash. D. C. 20056.

Building Science Series—Disseminates technical information developed at the Bureau on building materials, components, systems, and whole structures. The series presents research results, test methods, and performance criteria related to the structural and environmental functions and the durability and safety characteristics of building elements and systems.

Technical Notes—Studies or reports which are complete in themselves but restrictive in their treatment of a subject. Analogous to monographs but not so comprehensive in scope or definitive in treatment of the subject area. Often serve as a vehicle for final reports of work performed at NBS under the sponsorship of other government agencies.

Voluntary Product Standards—Developed under procedures published by the Department of Commerce in Part 10, Title 15, of the Code of Federal Regulations. The purpose of the standards is to establish nationally recognized requirements for products, and to provide all concerned interests with a basis for common understanding of the characteristics of the products. NBS administers this program as a supplement to the activities of the private sector standardizing organizations.

Federal Information Processing Standards Publications (FIPS PUBS)—Publications in this series collectively constitute the Federal Information Processing Standards Register. Register serves as the official source of information in the Federal Government regarding standards issued by NBS pursuant to the Federal Property and Administrative Services Act of 1949 as amended, Public Law 89-306 (79 Stat. 1127), and as implemented by Executive Order 11717 (38 FR 12315, dated May 11, 1973) and Part 6 of Title 15 CFR (Code of Federal Regulations).

Consumer Information Series—Practical information, based on NBS research and experience, covering areas of interest to the consumer. Easily understandable language and illustrations provide useful background knowledge for shopping in today's technological marketplace.

NBS Interagency Reports (NBSIR)—A special series of interim or final reports on work performed by NBS for outside sponsors (both government and non-government). In general, initial distribution is handled by the sponsor; public distribution is by the National Technical Information Service (Springfield, Va. 22161) in paper copy or microfiche form.

Order NBS publications (except NBSIR's and Bibliographic Subscription Services) from: Superintendent of Documents, Government Printing Office, Washington, D.C. 20402.

BIBLIOGRAPHIC SUBSCRIPTION SERVICES

The following current-awareness and literature-survey bibliographies are issued periodically by the Bureau:

Cryogenic Data Center Current Awareness Service

A literature survey issued biweekly. Annual subscription: Domestic, $20.00; foreign, $25.00.

Liquefied Natural Gas. A literature survey issued quarterly. Annual subscription: $20.00.

Superconducting Devices and Materials. A literature survey issued quarterly. Annual subscription: $20.00. Send subscription orders and remittances for the preceding bibliographic services to National Technical Information Service, Springfield, Va. 22161.

Electromagnetic Metrology Current Awareness Service Issued monthly. Annual subscription: $100.00 (Special rates for multi-subscriptions). Send subscription order and remittance to Electromagnetics Division, National Bureau of Standards, Boulder, Colo. 80302.

U.S. DEPARTMENT OF COMMERCE
National Bureau of Standards
Washington, D.C. 20234

OFFICIAL BUSINESS

Penalty for Private Use, $300

POSTAGE AND FEES PAID
U.S. DEPARTMENT OF COMMERCE
COM-215

FOURTH CLASS MAIL

U.S.MAIL