

# Rate Constants for Reactions of Aliphatic Carbon-Centered Radicals in Aqueous Solution

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Alberta B. Ross and Pedatsur Neta

Radiation Chemistry Data Center  
Radiation Laboratory  
University of Notre Dame  
Notre Dame, IN 46556



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## 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 are 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.



ERNEST AMBLER, *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.

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# Rate Constants for Reactions of Aliphatic Carbon-Centered Radicals in Aqueous Solution

Alberta B. Ross and Pedatsur Neta

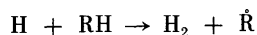
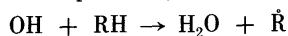
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Rate constants have been compiled for reactions of various transient aliphatic radicals produced mostly by radiolysis in aqueous solutions. In certain cases the radicals have been produced by photolysis or by a thermal chemical reaction. Data are included for aliphatic carbon-centered radicals only, i.e. substituted alkyl radicals in the broad sense, but not for oxyl or aminyl radicals. Reactions of the aliphatic radicals with inorganic and organic compounds are included.

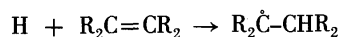
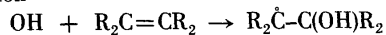
Key words: Alkyl radicals; aminoalkyl radicals; aqueous solution; carboxyalkyl radicals; chemical kinetics; electron transfer; haloalkyl radicals; hydroxyalkyl radicals; photolysis; radical anions; radiolysis; rates.

## Introduction

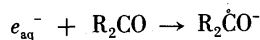
The radiolysis of water produces the short-lived intermediates, hydrated electrons, hydrogen atoms, and hydroxyl radicals, which react with a variety of aliphatic compounds to produce secondary radicals (73G030, 75G001, 75C002, 77C011).<sup>1</sup> In general, OH radicals and H atoms react with aliphatic compounds by hydrogen abstraction



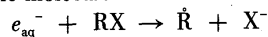
or by addition



while  $e_{\text{aq}}^-$  may add to form an anion radical



or to dissociate the molecule



This compilation includes reaction rates for radicals produced by each of the above mechanisms and for similar radicals produced by photolysis or by chemical reactions in aqueous solutions.

The radicals studied most extensively are  $\alpha$ -hydroxyalkyl radicals, produced by reaction of OH with alcohols or by addition of  $e_{\text{aq}}^-$  to a carbonyl group. These radicals react with many inorganic and organic compounds by one-electron reduction, although addition and abstraction reactions sometimes take place as well. Another type of reducing radical is produced by addition of  $e_{\text{aq}}^-$  to various acids, esters, and amides, mostly unsaturated. Alkyl radicals which do not contain a hydroxy or amino group on the carbon bearing the unpaired electron (or conjugated with it) are weaker reductants and react more slowly either by electron transfer or by addition or abstraction.

Alkyl radicals with an  $\alpha$ -carbonyl group behave mostly as oxidizing radicals and react by one-electron transfer. This type of radical is produced in most cases by hydrogen abstraction from 1,2-glycols, followed by water elimination, e.g.



Most of the radicals included in these tables exhibit only weak absorptions in the UV, which are not very convenient for the study of their reaction rates by kinetic spectrophotometry. Many of the reactions have, therefore, been studied by following changes in optical absorption of the substrate or its reaction product.

In certain cases, the process monitored by kinetic spectrophotometry is not the only reaction occurring in the system. This happens under various conditions: a. The primary radical attacks the substrate at more than one site,

<sup>1</sup>Literature references are cited following the tables.

e.g. the OH radical abstracts hydrogen from alcohols mostly from the alpha position and to some extent from other sites. As a result the system contains a mixture of the reducing  $\alpha$ -hydroxyalkyl radicals and the much less reactive  $\beta$ -hydroxy- and  $\gamma$ -hydroxy-, etc. or alkoxy radicals. b. Both OH and H may react with the substrate but yield different radicals, e.g. OH and H adducts. c. The radical produced by the initial attack may undergo certain processes before reacting with the substrate, e.g. protonation on carbon, acid-base equilibria, water elimination. Under certain conditions more than one form of the radical may react with the substrate. d. The aliphatic radical may react with the substrate by more than one mechanism, e.g. electron transfer and addition, of which only one is spectrophotometrically monitored. e. The aliphatic radical may react with the substrate slowly and undergo radical-radical decay as a competing process.

In many of the above cases, the reaction observed constitutes the main process (>90%) so that the rate constant measured can be taken to represent that reaction. However, when the observation is made on a less dominant process, the experimental rate constant may not represent the real value for that reaction. In these cases, the experimental values are reported in the tables and marked "uncorrected". The corrected value can sometimes be derived after considering the unobserved reactions.

## Arrangement of the Tables

A numbered list of the radicals for which reaction rate data have been compiled precedes the tables. Numbers have been assigned to the radicals for use in numbering the reactions in subsequent tables, to identify the radical and to provide a means of generating an index. A name and line formula are listed for most of the radicals. Line formulae for radicals containing rings are written with dashes at the left and right to indicate the cycle, as  $-\dot{O}CHCH_2O(CH_2)_2-$  for the radical from dioxane (2,5-dioxacyclohexyl, 104). When more than one radical species may be involved the radicals are identified only by their origin, as "Radicals from glucose + OH".

Tables 1-3 contain the rate data for the reactions of the radicals with various substrates. Inorganic ions and molecules are grouped in table 1, in alphabetic order by the symbol for the main element. Organic substrates are listed alphabetically by name in table 2. Table 3 contains proton transfer reactions of radicals with acids, bases and buffer components. Entries for each substrate are numbered, and each reaction has an entry number including both the number of the substrate and the radical number. For example, the reaction of oxygen with methyl radical is 93.001, while oxygen with carboxymethyl radical is 93.035. Reactions of substrates with radicals in more than one acid-base form are listed in the tables under the same entry number.

Table 4 contains a few representative radical-radical reactions whose rates have been determined in most cases by measuring the second-order decay rate of the optical absorption ( $2k/\epsilon$ ). The molar absorptivity,  $\epsilon$ , used to calculate the rate constant  $k$  is given in the *Comments* column.

Products are listed only for those reactions for which evidence has been obtained on the nature of the products. The error limits given are those reported in the original papers; lacking such a statement the uncertainty in the rate constant should be assumed to be  $\pm 25\%$ . Many of the second order rate constants are derived from pseudo-first order rates for the decay of the transient radical or the substrate or the build-up of a product. Rate constants for certain reactions have been used as reference values to determine values for other reactions, which are labeled "rel."; in those cases the reference values are listed in the *Comments* column. The label "uncor." is used for observed values of  $k$  measured in systems in which more than one process is occurring.

Temperature is assumed to be ambient unless otherwise specified. The *Method* column indicates the method for generation of the transient and in the *Comments* column the method of measurement is indicated along with the source of the transient and other information such as activation energy,  $pK$ , etc. When the symbol R is used in a *Comment*, such as in  $G(R)$  or  $k(R + R)$ , it refers to the radical of the same entry. *References* are indicated by the serial number from the Radiation Chemistry Data Center bibliographic data base, from which the reference list was generated. The first two digits of the serial number represent the year in which the work was published.

*Indexes* have been produced from tables 1-3 for reactions of (1) the radicals in order of their number and for (2) the radicals and substrates by molecular formula. The indexes follow the tables.

## Acknowledgments

The assistance of Dr. W. Phillip Helman in providing programs for indexing and text processing is gratefully acknowledged. We also wish to thank Dr. Norman Lichtin and Dr. Guillermo Ferraudi for their useful comments on tables 3 and 1, respectively.

The Radiation Laboratory is operated under Contract DE-AC02-76ER00038 with the Department of Energy. The Radiation Chemistry Data Center is supported jointly by the Office of Standard Reference Data of the National Bureau of Standards and of the Office of Basic Energy Sciences and the Office of Health and Environmental Research of the Department of Energy. This is Radiation Laboratory Document No. NDRL-2196.

## List of Abbreviations and Symbols

<i>A</i>	frequency factor	<i>G</i>	radiation yield (molecules per 100 eV)
Ac	acetyl	gly	glycine or glycinato
ala	alanine	$\Delta H^\ddagger$	activation enthalpy
abs.	absorption	<i>I</i>	ionic strength
abstr.	abstraction	irradn.	irradiation
addn.	addition	<i>K</i>	equilibrium constant
alk.	alkaline	<i>k</i>	rate constant
bpy	2,2'-bipyridine	<i>k<sub>f</sub></i>	specific rate of the forward reaction
BuOH	butanol	<i>k<sub>r</sub></i>	specific rate of the reverse reaction
calcd.	calculated	<i>L</i>	ligand
chem.	chemical	Me	methyl
c.k.	competition kinetics	meas.	measured
concn.	concentration	MeOH	methanol
condy.	conductivity	NaLS	sodium dodecylsulfate
contg.	containing	obs.	observed
cor.	corrected	o.d.	optical density
CTAB	hexadecyltrimethylammonium bromide	p.b.k.	product buildup kinetics
detd.	determined	phot.	photolysis
dien	diethylenetriamine	$pK_a$	negative logarithm of the acid dissociation constant, e.g., where $AH + H_2O \rightleftharpoons A^- + H_3O^+$
d.k.	decay kinetics (decay of radical absorption and bleaching of substrate absorption)	PNAP	<i>p</i> -nitroacetophenone
<i>e</i> -r.	electron radiolysis	PNBPA	<i>p</i> -nitrobenzoato(pentaammine)cobalt(III) ion
$\epsilon$	extinction coefficient (molar absorptivity)	p.r.	pulse radiolysis
$E_a$	activation energy	PrOH	propanol
en	ethylenediamine	R	radical
esr	electron spin resonance	redn.	reduction
estd.	estimated	rel.	relative
EtOH	ethanol	RNO	<i>N,N</i> -dimethyl- <i>p</i> -nitrosoaniline
Et <sub>2</sub> O	ethyl ether	$\Delta S^\ddagger$	activation entropy
f.p.	flash photolysis	satd.	saturated
formn.	formation	soln.	solution
$\gamma$ -r.	gamma radiolysis		



## List of Aliphatic Radicals

Reactions of the following radicals are included in these tables; comments within the tables identify the compounds from which the radicals were derived. Only one acid-base form is listed below but different forms may be used in the tables, depending on pH. The entry numbers for the reactions in the tables include the three-digit numbers listed below following the decimal point. Thus, the first reaction in the tables is numbered 1.016 and involves the radical from *tert*-

butanol,  $\cdot\text{CH}_2\text{C}(\text{CH}_3)_2\text{OH}$ , which is 016 in the following list. The numbers have been used to create an index to reactions of the various radicals; the index follows the tables. Radicals herein are restricted to carbon radicals and have been ordered from the most *hydrogen* substitution on carbon to the most *oxygen* substitution. That is, radicals  $\cdot\text{CXYZ}$  are ordered as X, Y, and Z progressively represent H, C, halogens, N, and O.

001	Methyl	$\cdot\text{CH}_3$
002	Ethyl	$\cdot\text{CH}_2\text{CH}_3$
002a	1-Methylethyl	$(\text{CH}_3)_2\dot{\text{C}}\text{H}$
002b	1,1-Dimethylethyl	$(\text{CH}_3)_3\dot{\text{C}}$
003	Radicals from pentane	$\cdot\text{C}_5\text{H}_{11}$
004	Cyclopentyl	$c\text{-}\dot{\text{C}}_5\text{H}_9$
005	2-Chloroethyl	$\cdot\text{CH}_2\text{CH}_2\text{Cl}$
006	2-Carboxy-2,2-dimethylethyl	$\cdot\text{CH}_2\text{C}(\text{CH}_3)_2\text{CO}_2\text{H}$
007	Radicals from oleate + OH	R
008	Radicals from linoleate + OH	R
009	Radicals from linolenate + OH	R
010	Radicals from arachidonate + OH	R
011	2-Aminoethyl	$\cdot\text{CH}_2\text{CH}_2\text{NH}_2$
012	2-Amino-2,2-dimethylethyl	$\cdot\text{CH}_2\text{C}(\text{CH}_3)_2\text{NH}_2$
013	2-Amino-2-carboxy-2-methylethyl	$\cdot\text{CH}_2\text{C}(\text{CH}_3)(\text{NH}_2)\text{CO}_2\text{H}$
014	2-Hydroxyethyl	$\cdot\text{CH}_2\text{CH}_2\text{OH}$
015	2-Hydroxypropyl	$\cdot\text{CH}_2\text{CHOHCH}_3$
016	2-Hydroxy-2,2-dimethylethyl	$\cdot\text{CH}_2\text{C}(\text{CH}_3)_2\text{OH}$
016a	Radicals from cyclopentene + OH	R
017	2-Carboxy-2-hydroxy-2-methylethyl	$\cdot\text{CH}_2\text{C}(\text{CH}_3)(\text{OH})\text{CO}_2\text{H}$
018	Radicals from allyl alcohol + OH	R
019	Radicals from crotyl alcohol + OH	R
020	Formylmethyl	$\cdot\text{CH}_2\text{CHO}$
021	1-Formylethyl	$\text{CH}_3\dot{\text{C}}\text{HCHO}$
022	2-Hydroxyethenyl	$\cdot\text{CH}=\text{CHOH}$
023	2-Oxopropyl	$\cdot\text{CH}_2\text{COCH}_3$
024	1-Acetyethyl	$\text{CH}_3\text{CO}\dot{\text{C}}\text{HCH}_3$
025	2-Oxocyclohexyl	$-(\text{CH}_2)_4\dot{\text{C}}\text{HCO}-$
026	1-Formyl-2-hydroxyethyl	$\text{HOCH}_2\dot{\text{C}}\text{HCHO}$
027	4-Hydroxy-2-oxobutyl	$\text{HOCH}_2\text{CH}_2\text{CO}\dot{\text{C}}\text{H}_2$
028	1-Formyl-4-hydroxybutyl	$\text{HOCH}_2(\text{CH}_2)_2\dot{\text{C}}\text{HCHO}$
029	1-Formyl-5-hydroxypentyl	$\text{HOCH}_2(\text{CH}_2)_3\dot{\text{C}}\text{HCHO}$
030	Radicals from <i>meso</i> -erythritol	R
031	Radicals from xylitol	R
032	2-Oxo-3,4,5-trihydroxycyclohexyl	$-(\text{CHOH})_3\text{CH}_2\dot{\text{C}}\text{HCO}-$
033	Radicals from sorbitol	R
034	Carbamoylmethyl	$\cdot\text{CH}_2\text{CONH}_2$
035	Carboxymethyl	$\cdot\text{CH}_2\text{CO}_2\text{H}$
036	Methoxycarbonylmethyl	$\cdot\text{CH}_2\text{CO}_2\text{CH}_3$
037	1-Carboxyethyl	$\text{CH}_3\dot{\text{C}}\text{HCO}_2\text{H}$
038	1-Carboxypropyl	$\text{CH}_3\text{CH}_2\dot{\text{C}}\text{HCO}_2\text{H}$
039	1-Carboxy-2-hydroxyethyl	$\text{HOCH}_2\dot{\text{C}}\text{HCO}_2\text{H}$
040	1-Carboxy-2-hydroxypropyl	$\text{CH}_3\text{CHOH}\dot{\text{C}}\text{HCO}_2\text{H}$
040a	1,2-Dicarboxyethyl	$\text{HO}_2\dot{\text{C}}\text{HCH}_2\text{CO}_2\text{H}$
041	1,2-Dicarboxy-2-hydroxyethyl	$\text{HO}_2\text{CCHOH}\dot{\text{C}}\text{HCO}_2\text{H}$

042	Dicarboxymethyl	$\cdot\text{CH}(\text{CO}_2\text{H})_2$
043	Chloromethyl	$\cdot\text{CH}_2\text{Cl}$
044	Difluoromethyl	$\cdot\text{CHF}_2$
045	Dichloromethyl	$\cdot\text{CHCl}_2$
046	Dichlorofluoromethyl	$\cdot\text{CFCl}_2$
047	Trifluoromethyl	$\cdot\text{CF}_3$
048	Trichloromethyl	$\cdot\text{CCl}_3$
049	1-Aminoethyl	$\text{CH}_3\dot{\text{C}}\text{HNH}_2$
050	1-Amino-1-methylethyl	$(\text{CH}_3)_2\dot{\text{C}}\text{NH}_2$
051	1-( <i>N,N</i> -Diethylamino)ethyl	$\text{CH}_3\dot{\text{C}}\text{HN}(\text{C}_2\text{H}_5)_2$
052	Triethylammonioethyl	$\text{CH}_3\dot{\text{C}}\text{HN}^+(\text{C}_2\text{H}_5)_3$
053	( <i>N</i> -Acetylamino)methyl	$\text{CH}_3\text{CONH}\dot{\text{C}}\text{H}_2$
054	( <i>N</i> -Formyl- <i>N</i> -methylamino)methyl	$\text{HCON}(\text{CH}_3)\dot{\text{C}}\text{H}_2$
055	( <i>N</i> -Acetyl- <i>N</i> -methylamino)methyl	$\text{CH}_3\text{CON}(\text{CH}_3)\dot{\text{C}}\text{H}_2$
056	Amino(carboxy)methyl	$\text{NH}_2\dot{\text{C}}\text{HCO}_2\text{H}$
057	Amino(carbamoyl)methyl	$\text{NH}_2\dot{\text{C}}\text{HCONH}_2$
058	Radicals from glycylglycinamide + OH	R
059	Carboxy( <i>N</i> -methylamino)methyl	$\text{CH}_3\text{NH}\dot{\text{C}}\text{HCO}_2\text{H}$
060	<i>N</i> -Acetylamino(carboxy)methyl	$\text{CH}_3\text{CONH}\dot{\text{C}}\text{HCO}_2\text{H}$
061	<i>N</i> -Acetyl- <i>N</i> -methylamino(carboxy)methyl	$\text{CH}_3\text{CON}(\text{CH}_3)\dot{\text{C}}\text{HCO}_2\text{H}$
062	Radical from glycine anhydride + OH	R
063	Radical from alanine anhydride + OH	R
064	Radical from sarcosine anhydride + OH	R
065	Radicals from diglycine + OH	R
066	Radicals from glycylsarcosine + OH	R
067	Radicals from acetyldiglycine + OH	R
068	Radicals from triglycine + OH	R
069	Radicals from acetyltriglycine + OH	R
070	Radicals from acetyltrialanine + OH	R
071	Radicals from acetyltrisarcosine + OH	R
072	Radicals from acetylserineamide + OH	R
073	Radicals from acetylaspargine + OH	R
074	Radical from 2-pyrrolidone-5-carboxylic acid	R
075	Hydroxymethyl	$\cdot\text{CH}_2\text{OH}$
076	1-Hydroxyethyl	$\text{CH}_3\dot{\text{C}}\text{HOH}$
077	1-Hydroxypropyl	$\text{CH}_3\text{CH}_2\dot{\text{C}}\text{HOH}$
078	1-Hydroxy-1-methylethyl	$(\text{CH}_3)_2\dot{\text{C}}\text{OH}$
079	1-Hydroxybutyl	$\text{CH}_3(\text{CH}_2)_2\dot{\text{C}}\text{HOH}$
080	1-Hydroxy-1-methylpropyl	$\text{CH}_3\text{CH}_2\dot{\text{C}}\text{OHCH}_3$
081	1-Hydroxy-2-methylpropyl	$(\text{CH}_3)_2\text{CH}\dot{\text{C}}\text{HOH}$
082	1-Hydroxypentyl	$\text{CH}_3(\text{CH}_2)_3\dot{\text{C}}\text{HOH}$
083	(Cyclohexyl)hydroxymethyl	$c\text{-C}_6\text{H}_{11}\dot{\text{C}}\text{HOH}$
084	1-Hydroxycyclobutyl	$-\text{CH}_2\dot{\text{C}}\text{OH}(\text{CH}_2)_2-$
085	1-Hydroxycyclopentyl	$-\text{CH}_2\dot{\text{C}}\text{OH}(\text{CH}_2)_3-$
086	1-Hydroxycyclohexyl	$-\text{CH}_2\dot{\text{C}}\text{OH}(\text{CH}_2)_4-$
087	1-Hydroxycycloheptyl	$-\text{CH}_2\dot{\text{C}}\text{OH}(\text{CH}_2)_5-$
088	1-Hydroxycyclooctyl	$-\text{CH}_2\dot{\text{C}}\text{OH}(\text{CH}_2)_6-$
089	2,2,2-Trifluoro-1-hydroxyethyl	$\cdot\text{CHOHCF}_3$
090	Acetoxymethyl	$\text{CH}_3\text{CO}_2\dot{\text{C}}\text{H}_2$
091	1-Sulfatoethyl	$\text{CH}_3\dot{\text{C}}\text{HOSO}_3^-$
092	Radicals from sodium dodecylsulfate	R
092a	Methoxymethyl	$\cdot\text{CH}_2\text{OCH}_3$
093	1-Ethoxyethyl	$\text{CH}_3\dot{\text{C}}\text{HOC}_2\text{H}_5$
093a	1,1-Dimethylethoxymethyl	$\cdot\text{CH}_2\text{OC}(\text{CH}_3)_3$
094	2-Tetrahydrofuryl	$-\text{O}\dot{\text{C}}\text{H}(\text{CH}_2)_3-$
094a	(Methoxymethoxy)methyl	$\cdot\text{CH}_2\text{OCH}_2\text{OCH}_3$
095	1,4-Dihydroxybutyl	$\cdot\text{CHOHCH}_2\text{CH}_2\text{CH}_2\text{OH}$
096	1,3-Dihydroxy-2,2-di(hydroxymethyl)propyl	$\cdot\text{CHOHC}(\text{CH}_2\text{OH})_3$

097	2-Carboxy-1-hydroxy-1-methylethyl	$\text{CH}_3\dot{\text{C}}\text{OHCH}_2\text{CO}_2\text{H}$
098	2-Amino-1-hydroxyethyl	$\text{NH}_2\text{CH}_2\dot{\text{C}}\text{HOH}$
099	2-Amino-1-phosphoryloxyethyl	$\text{NH}_2\text{CH}_2\dot{\text{C}}\text{HOPO}_2\text{OH}$
100	2-Amino-2-carboxy-1-hydroxyethyl	$\cdot\text{CHOHCH}(\text{NH}_2)\text{CO}_2\text{H}$
101	1,2-Dihydroxyethyl	$\cdot\text{CHOHCH}_2\text{OH}$
102	1,2-Dihydroxypropyl	$\cdot\text{CHOHCHOHCH}_3$
103	1,2-Dihydroxy-1-methylpropyl	$\text{CH}_3\dot{\text{C}}\text{OHCHOHCH}_3$
104	2,5-Dioxacyclohexyl	$-\text{O}\dot{\text{C}}\text{HCH}_2\text{O}(\text{CH}_2)_2-$
105	Radicals from polyethyleneglycol	$-\text{O}\dot{\text{C}}\text{HCH}_2(\text{OCH}_2\text{CH}_2)_n-$
106	1,2,3-Trihydroxypropyl	$\cdot\text{CHOHCHOHCH}_2\text{OH}$ (+ $\text{CH}_2\text{OH}\dot{\text{C}}\text{OHCH}_2\text{OH}$ )
107	1-Hydroxy-1-methyl-2-oxopropyl	$\text{CH}_3\text{CO}\dot{\text{C}}(\text{O}^-)\text{CH}_3$
108	Radicals from deoxyribose + OH	R
109	Radicals from ribose + OH	R
110	Radicals from ribose phosphate + OH	R
111	Radicals from glucose + OH	R
112	Radicals from sucrose + OH	R
113	Radical from ascorbate + OH	$\cdot\text{A}^-$
114	(Carbamoyl)hydroxymethyl	$\cdot\text{CHOHCONH}_2$
115	(Carboxy)hydroxymethyl	$\cdot\text{CHOHCO}_2\text{H}$
116	1-Carbamoyl-1-hydroxyethyl	$\text{CH}_3\dot{\text{C}}\text{OHCONH}_2$
117	1-Carboxy-1-hydroxyethyl	$\text{CH}_3\dot{\text{C}}\text{OHCO}_2\text{H}$
118	1-Hydroxy-1-(methoxycarbonyl)ethyl	$\text{CH}_3\dot{\text{C}}\text{OHCO}_2\text{CH}_3$
119	(Dicarboxy)hydroxymethyl	$\text{HO}_2\text{C}\dot{\text{C}}\text{OHCO}_2\text{H}$
120	1,2-Dicarboxy-1-hydroxyethyl	$\text{HO}_2\text{C}\dot{\text{C}}\text{OHCH}_2\text{CO}_2\text{H}$
121	1,2-Dicarboxy-1,2-dihydroxyethyl	$\text{HO}_2\text{C}\dot{\text{C}}\text{OHCHOHCO}_2\text{H}$
122	1,3-Dicarboxy-1-hydroxypropyl	$\text{HO}_2\text{C}\dot{\text{C}}\text{OH}(\text{CH}_2)_2\text{CO}_2\text{H}$
123	Dihydroxymethyl	$\cdot\text{CH}(\text{OH})_2$
124	Dimethoxymethyl	$\cdot\text{CH}(\text{OCH}_3)_2$
125	2,5-Dioxacyclopentyl	$-\text{O}\dot{\text{C}}\text{HO}(\text{CH}_2)_2-$
126	2,2,2-Trichloro-1,1-dihydroxyethyl	$\text{CCl}_3\dot{\text{C}}(\text{OH})_2$
127	Carbamoyl	$\cdot\text{CONH}_2$
128	Electron adduct of acrylamide	$[\text{CH}_2\text{CHCONH}_2]^-$
129	Electron adduct of crotonamide	$[\text{CH}_3\text{CHCHCONH}_2]^-$
130	Electron adduct of methacrylamide	$[\text{CH}_2\text{C}(\text{CH}_3)\text{CONH}_2]^-$
131	Electron adduct of $\beta,\beta$ -dimethylacrylamide	$[(\text{CH}_3)_2\text{CCHCONH}_2]^-$
132	Electron adduct of <i>N,N</i> -dimethylacrylamide	$[\text{CH}_2\text{CHCON}(\text{CH}_3)_2]^-$
133	Electron adduct of Diamide	R
134	Electron adduct of acrylate	$[\text{CH}_2\text{CHCO}_2\text{H}]^-$
135	Electron adduct of crotonate	$[\text{CH}_3\text{CHCHCO}_2\text{H}]^-$
136	Electron adduct of methacrylate	$[\text{CH}_2\text{C}(\text{CH}_3)\text{CO}_2\text{H}]^-$
137	Electron adduct of $\beta,\beta$ -dimethylacrylate	$[(\text{CH}_3)_2\text{CCHCO}_2\text{H}]^-$
138	Electron adduct of methyl methacrylate	$[\text{CH}_2\text{C}(\text{CH}_3)\text{CO}_2\text{CH}_3]^-$
139	Electron adduct of sorbate	$[\text{CH}_3\text{CHCHCHCHCO}_2\text{H}]^-$
141	Electron adduct of dimethyl fumarate	R
142	Electron adduct of glycine anhydride	R
143	Electron adduct of alanine anhydride	R
144	Electron adduct of sarcosine anhydride	R
146	Electron adduct of acetylglycylglycinamide	R
147	Carboxyl	$\cdot\text{CO}_2^- / \cdot\text{CO}_2\text{H}$
148	Electron adduct of methyl acetate	$\text{CH}_3\dot{\text{C}}(\text{O}^-)\text{OCH}_3$

TABLE 1. Rate constants for reactions of aliphatic radicals with inorganic solutes in aqueous solution

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
<b>Ag</b>						
<b>1. Silver(I) ion</b>						
1.016	$\cdot\text{CH}_2\text{C}(\text{CH}_3)_2\text{OH} + \text{Ag}^+ \rightarrow \text{Ag}^0$		nat	p.r.	No electron transfer to give Ag <sup>0</sup> in 0.1 mol L <sup>-1</sup> <i>tert</i> -BuOH.	78A410
1.075	$\cdot\text{CH}_2\text{OH} + \text{Ag}^+ \rightarrow \text{Ag}^0$		nat	p.r.	No electron transfer to give Ag <sup>0</sup> in 0.1 mol L <sup>-1</sup> MeOH.	78A410
1.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{Ag}^+ \rightarrow \text{Ag}^0$		nat	p.r.	No electron transfer to give Ag <sup>0</sup> in 0.1 mol L <sup>-1</sup> 2-PrOH.	78A410
1.128	$[\text{CH}_2\text{CHCONH}_2]^- + \text{Ag}^+ \rightarrow \text{Ag}^0$ + H <sup>+</sup> + CH <sub>2</sub> =CHCONH <sub>2</sub>	(1.1 ± 0.4) × 10 <sup>8</sup>	~6	p.r.	P.b.k. at 313 nm in soln. contg. acrylamide.	70G052
1.147	$\cdot\text{CO}_2^- + \text{Ag}^+ \rightarrow \text{AgCO}_2$ (+ Ag <sup>+</sup> ) → Ag <sub>2</sub> CO <sub>2</sub> <sup>+</sup>		nat	p.r.	Ag <sup>+</sup> was reduced in 10 <sup>-2</sup> mol L <sup>-1</sup> formate soln. contg. CO <sub>2</sub> by a complex mechanism.	78A410
<b>2. Silver(I) ion, complex with Ag(0)</b>						
2.016	$\cdot\text{CH}_2\text{C}(\text{CH}_3)_2\text{OH} + \text{Ag}_2^+ \rightarrow$ 2 Ag <sup>+</sup> + OH <sup>-</sup> + CH <sub>2</sub> =C(CH <sub>3</sub> ) <sub>2</sub>	2.0 × 10 <sup>9</sup>	nat	p.r.	Calcd. from best fit for increase in condy. as function of time in 0.1 mol L <sup>-1</sup> <i>tert</i> -BuOH-5 × 10 <sup>-4</sup> mol L <sup>-1</sup> AgClO <sub>4</sub> soln.	78A410
2.075	$\cdot\text{CH}_2\text{OH} + \text{Ag}_2^+ \rightarrow \text{Ag}_2\text{CH}_2\text{OH}^+$ → CH <sub>2</sub> O + H <sup>+</sup> + Ag <sub>2</sub>	5.0 × 10 <sup>9</sup>	nat	p.r.	Calcd. from increase in condy. as function of time in 0.1 mol L <sup>-1</sup> MeOH-5 × 10 <sup>-4</sup> mol L <sup>-1</sup> AgClO <sub>4</sub> soln. assuming values for $k(\text{R} + \text{R})$ , [Ag <sub>2</sub> <sup>+</sup> ], [R], and [H <sub>2</sub> O <sub>2</sub> ].	78A410
2.076	$\text{CH}_3\dot{\text{C}}\text{HOH} + \text{Ag}_2^+ \rightarrow$ CH <sub>3</sub> CHO + H <sup>+</sup> + Ag <sub>2</sub>	1.0 × 10 <sup>9</sup>		p.r.	Calcd. from increase in condy. as function of time in EtOH-AgClO <sub>4</sub> soln. assuming values for $k(\text{R} + \text{R})$ , [Ag <sub>2</sub> <sup>+</sup> ], [R], and [H <sub>2</sub> O <sub>2</sub> ].	78A410
2.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{Ag}_2^+ \rightarrow$ (CH <sub>3</sub> ) <sub>2</sub> CO + H <sup>+</sup> + Ag <sub>2</sub>	2.5 × 10 <sup>9</sup>		p.r.	Calcd. from increase in condy. as function of time in 0.1 mol L <sup>-1</sup> 2-PrOH-5 × 10 <sup>-4</sup> mol L <sup>-1</sup> AgClO <sub>4</sub> soln. assuming values for $k(\text{R} + \text{R})$ , [Ag <sub>2</sub> <sup>+</sup> ], [R], and [H <sub>2</sub> O <sub>2</sub> ].	78A410
<b>Br</b>						
<b>3. Bromate ion</b>						
3.076	$\text{CH}_3\dot{\text{C}}\text{HOH} + \text{BrO}_3^-$ $\text{CH}_3\dot{\text{C}}\text{HO}^- + \text{BrO}_3^-$	< 5 × 10 <sup>6</sup> (3.0 ± 0.5) × 10 <sup>7</sup>	6 11.8	p.r.	D.k.; radical from ethanol.	72A018
<b>Cd</b>						
<b>4. Cadmium(I) ions</b>						
4.016	$\cdot\text{CH}_2\text{C}(\text{CH}_3)_2\text{OH} + \text{Cd}^+ \rightarrow$ Cd <sup>2+</sup> + (CH <sub>3</sub> ) <sub>2</sub> C=CH <sub>2</sub> + OH <sup>-</sup>	~1 × 10 <sup>9</sup>	nat	p.r.	Calcd. from opt. and condy. studies in <i>tert</i> -BuOH-Cd <sup>2+</sup> soln. assuming values for competing reactions.	75A064
	$\cdot\text{CH}_2\text{C}(\text{CH}_3)_2\text{OH} + \text{Cd}_2^{2+} \rightarrow \text{OH}^- +$ Cd <sup>+</sup> + (CH <sub>3</sub> ) <sub>2</sub> C=CH <sub>2</sub> + Cd <sup>2+</sup>	~1 × 10 <sup>9</sup>	nat	p.r.	See above.	75A064
4.075	$\cdot\text{CH}_2\text{OH} + \text{Cd}^+ \rightarrow \text{CdCH}_2\text{OH}^+$	2 × 10 <sup>8</sup>	nat	p.r.	D.k. at 300 nm (Cd <sup>+</sup> ) in soln. contg. MeOH and Cd <sup>2+</sup> , as well as condy. and p.b.k. at 240 nm (Cd <sub>2</sub> <sup>2+</sup> ); assumed $k(\text{Cd}^+ + \text{H}_2\text{O}_2) = 1.5 \times 10^9$ , $k(\text{R} + \text{R}) = 1.2 \times 10^9$ .	75A064

TABLE 1. Rate constants for reactions of aliphatic radicals with inorganic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
4.076	$\text{CH}_3\dot{\text{C}}\text{HOH} + \text{Cd}^+ \rightarrow \text{CdCHOHCH}_3^+$	$(1.3 \pm 0.6) \times 10^9$	nat	p.r.	D.k. at 300 nm ( $\text{Cd}^+$ ) in soln. contg. EtOH and $\text{Cd}^{2+}$ , as well as condy. and p.b.k. at 240 nm ( $\text{Cd}_2^{2+}$ ); assumed $k(\text{Cd}^+ + \text{H}_2\text{O}_2) = 1.5 \times 10^9$ , $k(\text{R} + \text{R}) = 1.15 \times 10^9$ and $2k(\text{Cd}^+ + \text{Cd}^+) = 3.0 \times 10^9$ .	75A064
4.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{Cd}^+ \rightarrow \text{CdC}(\text{CH}_3)_2\text{OH}^+$	$(2.4 \pm 1.2) \times 10^9$	nat	p.r.	D.k. at 300 nm ( $\text{Cd}^+$ ) in soln. contg. 2-PrOH and $\text{Cd}^{2+}$ , as well as condy. and p.b.k. at 240 nm ( $\text{Cd}_2^{2+}$ ); assumed $k(\text{Cd}^+ + \text{H}_2\text{O}_2) = 1.5 \times 10^9$ , $k(\text{R} + \text{R}) = 7 \times 10^8$ and $2k(\text{Cd}^+ + \text{Cd}^+) = 3.0 \times 10^9$ .	75A064
4.105	$-\text{O}\dot{\text{C}}\text{HCH}_2(\text{OCH}_2\text{CH}_2\text{O})_n^- + \text{Cd}^+$	$< 2 \times 10^8$	nat	p.r.	D.k. of $\text{Cd}^+$ in the presence of polyethylene glycol entirely by $\text{Cd}^+ + \text{Cd}^+$ ( $2k = 5 \times 10^9$ ); $2k(\text{R} + \text{R}) = 2.2 \times 10^7$ .	75A153
5.	<b>Cadmium(II) ion</b>					
5.016	$\cdot\text{CH}_2\text{C}(\text{CH}_3)_2\text{OH} + \text{Cd}^{2+}$	$< 10^6$	nat	p.r.	Est. from lack of increase in $\text{Cd}^+$ in 0.1 mol L <sup>-1</sup> $\text{Cd}^{2+}$ soln. upon addn. of 0.1 mol L <sup>-1</sup> <i>tert</i> -BuOH.	75A027
5.075	$\cdot\text{CH}_2\text{OH} + \text{Cd}^{2+}$	$< 2.5 \times 10^5$ $< 10^2$	nat nat	p.r. p.r.	No reaction. Est. from lack of increase in $\text{Cd}^+$ in 0.1 mol L <sup>-1</sup> $\text{Cd}^{2+}$ soln. upon addn. of 0.1 mol L <sup>-1</sup> MeOH.	75A153 75A027
5.076	$\text{CH}_3\dot{\text{C}}\text{HOH} + \text{Cd}^{2+}$	$< 2.5 \times 10^5$	nat	p.r.	No reaction.	75A153
5.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{Cd}^{2+}$	$< 10^6$		p.r.	Est. from lack of increase in $\text{Cd}^+$ in 0.1 mol L <sup>-1</sup> $\text{Cd}^{2+}$ soln. upon addn. of 0.1 mol L <sup>-1</sup> 2-PrOH.	75A027
5.101	$\cdot\text{CHOHCH}_2\text{OH} + \text{Cd}^{2+}$	$< 2.5 \times 10^5$	nat	p.r.	No reaction	75A153
5.105	$-\text{O}\dot{\text{C}}\text{HCH}_2(\text{OCH}_2\text{CH}_2\text{O})_n^- + \text{Cd}^{2+}$	$< 2.5 \times 10^5$	nat	p.r.	No reaction.	75A153
5.106	$\cdot\text{CHOHCHOHCH}_2\text{OH} + \text{Cd}^{2+}$	$< 2.5 \times 10^5$	nat	p.r.	No reaction.	75A153
5.147	$\cdot\text{CO}_2^- + \text{Cd}^{2+} \rightarrow \text{Cd}^+ + \text{CO}_2$	$\sim 10^5$		p.r.	Est. from increase in $\text{Cd}^+$ in 0.1 mol L <sup>-1</sup> $\text{Cd}^{2+}$ soln. contg. 0.1 mol L <sup>-1</sup> $\text{HCO}_2^-$ , $\text{CO}_2$ -satd.	75A027
		$(5.1 \pm 0.3) \times 10^6$	nat	p.r.	No details given.	75A153
	<b>Co</b>					
6.	<b>Cobalt(II) ions</b>					
6.016	$\cdot\text{CH}_2\text{C}(\text{CH}_3)_2\text{OH} + \text{Co}^{2+} \rightarrow \text{Co}^+$	$< 10^6$	nat	p.r.	Est. from lack of increase in $\text{Co}^+$ in 0.1 mol L <sup>-1</sup> $\text{Co}^{2+}$ soln. upon addn. of 0.1 mol L <sup>-1</sup> <i>tert</i> -BuOH.	75A027
6.075	$\cdot\text{CH}_2\text{OH} + \text{Co}^{2+} \rightarrow \text{Co}^+$	$< 10^2$	nat	p.r.	Est. from lack of increase in $\text{Co}^+$ in 0.1 mol L <sup>-1</sup> $\text{Co}^{2+}$ soln. upon addn. of 0.1 mol L <sup>-1</sup> MeOH.	75A027
6.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{Co}^{2+} \rightarrow \text{Co}^+$	$< 10^6$	nat	p.r.	Est. from lack of increase in $\text{Co}^+$ in 0.1 mol L <sup>-1</sup> $\text{Co}^{2+}$ soln. upon addn. of 0.1 mol L <sup>-1</sup> 2-PrOH.	75A027
6.147	$\cdot\text{CO}_2^- + \text{Co}^{2+} \rightarrow \text{CO}_2 + \text{Co}^+$	$10^2 < k < 10^5$	nat	p.r.	Est. from lack of increase in $\text{Co}^+$ in 0.1 mol L <sup>-1</sup> $\text{Co}^{2+}$ soln. upon addn. of 0.1 mol L <sup>-1</sup> formate, as well as $\gamma$ -r. expts. (73G039).	75A027
7.	<b>Diaqua(2,3,9,10-tetramethyl-1,4,8,11-tetraazacyclotetradeca-1,3,8,10-tetraene)cobalt(II) ion</b>					
7.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{CoL}(\text{H}_2\text{O})_2^{2+} \rightarrow \text{Co}(\text{I})$	$5.5 \times 10^9$	1.25, 6.5	p.r.	P.b.k. in 2 mol L <sup>-1</sup> 2-PrOH.	76A001
7.147	$\cdot\text{CO}_2^- + \text{CoL}(\text{H}_2\text{O})_2^{2+} \rightarrow \text{Co}(\text{I})$	$4.7 \times 10^9$	6.5	p.r.	P.b.k. in 0.1 mol L <sup>-1</sup> formate.	76A001

TABLE 1. Rate constants for reactions of aliphatic radicals with inorganic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
8.	<b>Diaqua(5,7,7,12,14,14-hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,14-diene)cobalt(II) ion</b>					
8.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{CoL}(\text{H}_2\text{O})_2^{2+} \rightarrow \text{Co(I)}$	$\ll 10^7$	6.5	p.r.	No reaction in 2 mol L <sup>-1</sup> 2-PrOH.	76A001
8.147	$\cdot\text{CO}_2^- + \text{CoL}(\text{H}_2\text{O})_2^{2+} \rightarrow \text{Co(I)}$	$\ll 10^7$	6.5	p.r.	No reaction in 0.1 mol L <sup>-1</sup> formate.	76A001
9.	<b>Diaqua(5,7,7,12,14,14-hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-diene)cobalt(II) ion</b>					
9.001	$\cdot\text{CH}_3 + \text{CoL}(\text{OH}_2)_2^{2+} \rightarrow$ $\text{CH}_3\text{Co}^{\text{III}}\text{L}(\text{OH}_2)_2^{2+}$	$\sim 7 \times 10^8$  (1 to 2) $\times 10^8$	1  9.5	f.p.  p.r.	Radical from $\text{Co}(\text{NH}_3)_5\text{O}_2\text{CCH}_3^{2+}$ in $\text{HClO}_4$ soln. D.k. at 330 nm ( $\text{Co}^{\text{II}}$ ) as well as p.b.k. at 280 nm in Ar-satd. 1 mol L <sup>-1</sup> <i>tert</i> -BuOH soln. contg. $5 \times 10^{-3}$ mol L <sup>-1</sup> $\text{CH}_3\text{I}$ .	74F644 76A203
9.016	$\cdot\text{CH}_2\text{C}(\text{CH}_3)_2\text{OH} + \text{CoL}(\text{OH}_2)_2^{2+}$	$< 1 \times 10^7$		p.r.	No reaction obs.	78A200
9.020	$\cdot\text{CH}_2\text{CHO} + \text{CoL}(\text{OH}_2)_2^{2+} \rightarrow$ $\text{Co}^{\text{III}}\text{LCH}_2\text{CHO}$	$8 \times 10^7$	1-3, 7-10	p.r.	P.b.k. in $\text{N}_2\text{O}$ -satd. soln. contg. 1 mol L <sup>-1</sup> ethylene glycol.	78A200
9.035	$\cdot\text{CH}_2\text{CO}_2^- + \text{CoL}(\text{OH}_2)_2^{2+}$	$< 1 \times 10^7$		p.r.	No reaction obs.	78A200
9.075	$\cdot\text{CH}_2\text{OH} + \text{CoL}(\text{OH}_2)_2^{2+} \rightarrow$ $\text{Co}^{\text{III}}\text{LCH}_2\text{OH}$	$(7 \pm 1) \times 10^7$	1-6	p.r.	P.b.k. in $\text{N}_2\text{O}$ -satd. soln. contg. 1 mol L <sup>-1</sup> MeOH.	78A200
9.076	$\text{CH}_3\dot{\text{C}}\text{HOH} + \text{CoL}(\text{OH}_2)_2^{2+} \rightarrow$ $\text{Co}^{\text{III}}\text{LCHOHCH}_3$	$(3.0 \pm 0.4) \times 10^7$	1-6	p.r.	P.b.k. in $\text{N}_2\text{O}$ -satd. soln. contg. 1 mol L <sup>-1</sup> EtOH.	78A200
9.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{CoL}(\text{OH}_2)_2^{2+}$	$\ll 10^7$	6.5	p.r.	No reaction obs. in soln. contg. 2 mol L <sup>-1</sup> 2-PrOH.	76A001
9.089	$\cdot\text{CHOHCF}_3 + \text{CoL}(\text{OH}_2)_2^{2+} \rightarrow$ $\text{Co}^{\text{III}}\text{LCHOHCF}_3$	$< 10^7$ (1 $\pm$ 0.5) $\times 10^7$	6	p.r.	No reaction obs.	78A200
9.098	$\text{NH}_3^+\text{CH}_2\dot{\text{C}}\text{HOH} + \text{CoL}(\text{OH}_2)_2^{2+}$	$4.0 \times 10^7$	7.0	p.r.	P.b.k. in $\text{N}_2\text{O}$ -satd. soln. contg. 0.1 mol L <sup>-1</sup> 2-aminoethanol; rate pH dependent.	78A200
9.101	$\cdot\text{CHOHCH}_2\text{OH} + \text{CoL}(\text{OH}_2)_2^{2+} \rightarrow$ $\text{Co}^{\text{III}}\text{LCHOHCH}_2\text{OH}$	$\sim 1 \times 10^7$	3-7	p.r.	P.b.k. in $\text{N}_2\text{O}$ -satd. soln. contg. 1 mol L <sup>-1</sup> ethylene glycol.	78A200
9.147	$\cdot\text{CO}_2^- + \text{CoL}(\text{OH}_2)_2^{2+}$	$\ll 10^7$	6.5	p.r.	No reaction obs. in soln. contg. 0.1 mol L <sup>-1</sup> formate.	76A001
10.	<b>Cobal(II)amin (Vitamin B12r)</b>					
10.001	$\cdot\text{CH}_3 + \text{B12r} \rightarrow$ methylcobalamin	$\sim 1.5 \times 10^9$		f.p.	D.k. following irradiation-induced $\text{Co}-\text{CH}_3$ homolysis of methylcobalamin; back reaction.	77F005
10.016	$\cdot\text{CH}_2\text{C}(\text{CH}_3)_2\text{OH} + \text{B12r} \rightarrow \text{B12a}$ (B12a See 54.)	$2.4 \times 10^8$	5	p.r.	P.b.k. at 350-60 nm in $\text{N}_2\text{O}$ -satd. soln. contg. 0.1 mol L <sup>-1</sup> <i>tert</i> -BuOH.	75A169
10.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{B12r} \rightarrow$ $\text{B12s}(\text{Co}^{\text{I}}) + (\text{CH}_3)_2\text{CO} + \text{H}^+$	$(4 \pm 2) \times 10^9$		f.p.	D.k. at 474 nm in 90% 2-PrOH soln. of adenosyl cobalamin after homolysis of the adenosyl group.	79A158
10.101	$\cdot\text{CHOHCH}_2\text{OH} + \text{B12r} \rightarrow \text{B12a}$ (B12a See 54.)	$2.4 \times 10^8$		p.r.	P.b.k. at 525 nm as well as d.k. at 400 nm in $\text{N}_2\text{O}$ -satd. soln. contg. 0.05 mol L <sup>-1</sup> ethylene glycol.	75A169
10.147	$\cdot\text{CO}_2^- + \text{B12r} \rightarrow \text{CO}_2 + \text{B12s}(\text{Co}^{\text{I}})$	$8.2 \times 10^8$	9.2	p.r.	D.k. at 311 and 478 nm as well as p.b.k. at 386 and 280 nm in $\text{N}_2\text{O}$ -satd. soln. contg. 0.1 mol L <sup>-1</sup> formate.	74A105
10a.	<b>3,10,17,24-Tetrakisulfophthalocyaninecobalt(II) ion dimer</b>					
10a.016	$\cdot\text{CH}_2\text{C}(\text{CH}_3)_2\text{OH} + (\text{Co}^{\text{II}}\text{pts})_2^{8-} \rightarrow$ addn.	$2.2 \times 10^8$	9	p.r.	P.b.k. at 440 nm in $\text{N}_2\text{O}$ -satd. soln. contg. 0.1-0.2 mol L <sup>-1</sup> <i>tert</i> -BuOH; mechanism suggested to involve addn. followed by splitting to give $(\text{RCo}^{\text{III}}\text{pts})_2^{5-}$ .	80A146
10a.075	$\cdot\text{CH}_2\text{OH} + (\text{Co}^{\text{II}}\text{pts})_2^{8-} \rightarrow$ electron transfer	$2.2 \times 10^8$	9	p.r.	D.k. in $\text{N}_2\text{O}$ -satd. soln. contg. 0.1-0.2 mol L <sup>-1</sup> MeOH; mechanism suggested to involve ligand-radical formation, followed by metal oxid. and dimer splitting to give $(\text{Co}^{\text{I}}\text{pts})_2^{7-}$ .	80A146
10a.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + (\text{Co}^{\text{II}}\text{pts})_2^{8-} \rightarrow$ electron transfer	$1.5 \times 10^9$	9	p.r.	D.k. in $\text{N}_2\text{O}$ -satd. soln. contg. 2-PrOH; see above.	80A146

TABLE 1. Rate constants for reactions of aliphatic radicals with inorganic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
<b>11. Nitriilotriacetatocobaltate(II) ion</b>						
11.016	$\cdot\text{CH}_2\text{C}(\text{CH}_3)_2\text{OH} + \text{Co}^{\text{II}}\text{NTA} \rightarrow$ $[\text{NTACoCH}_2\text{C}(\text{CH}_3)_2\text{OH}]^-$	$(1.1 \pm 0.2) \times 10^7$	7	p.r.	P.b.k. at 330 nm in N <sub>2</sub> O-satd. soln. contg. 0.5 mol L <sup>-1</sup> <i>tert</i> -BuOH.	79A255
11.147	$\cdot\text{CO}_2^- + \text{Co}^{\text{II}}\text{NTA} \rightarrow [\text{NTACo}(\text{CO}_2)]^{2-}$	$(7.3 \pm 0.7) \times 10^7$	7	p.r.	P.b.k. at 270 nm in N <sub>2</sub> O-satd. soln. contg. 0.2 mol L <sup>-1</sup> formate.	79A255
<b>Cobalt(III) ions</b>						
<b>12. Hexaamminecobalt(III) ion</b>						
12.035	$\cdot\text{CH}_2\text{CO}_2^- + \text{Co}(\text{NH}_3)_6^{3+}$	$< 3.2 \times 10^6$	7.3	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. 0.01 mol L <sup>-1</sup> acetate.	72A018
	$\cdot\text{CH}_2\text{CO}_2\text{H} + \text{Co}(\text{NH}_3)_6^{3+}$	$< 1.0 \times 10^7$	2.5	p.r.	D.k. in Ar-satd. soln. contg. 0.01 mol L <sup>-1</sup> acetic acid.	72A018
12.042	$\cdot\text{CH}(\text{CO}_2\text{H})_2 + \text{Co}(\text{NH}_3)_6^{3+}$	$< 8.0 \times 10^6$	2.5	p.r.	D.k. in Ar-satd. soln. contg. 0.01 mol L <sup>-1</sup> malonic acid.	72A018
12.054	$\text{HCON}(\text{CH}_3)\dot{\text{C}}\text{H}_2 + \text{Co}(\text{NH}_3)_6^{3+}$	$< 1.0 \times 10^7$	6.0	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. 0.01 mol L <sup>-1</sup> dimethylformamide.	72A018
12.056	$\text{NH}_3^+\dot{\text{C}}\text{HCO}_2^- + \text{Co}(\text{NH}_3)_6^{3+}$	$< 1.2 \times 10^7$	5.7	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> glycine.	72A018
12.075	$\cdot\text{CH}_2\text{O}^- + \text{Co}(\text{NH}_3)_6^{3+} \rightarrow$ $\text{CH}_2\text{O} + \text{Co}(\text{NH}_3)_6^{2+}$	$(9.0 \pm 1.4) \times 10^9$	12	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. 0.01 mol L <sup>-1</sup> MeOH.	72A018
	$\cdot\text{CH}_2\text{OH} + \text{Co}(\text{NH}_3)_6^{3+} \rightarrow$ $\text{CH}_2\text{O} + \text{H}^+ + \text{Co}(\text{NH}_3)_6^{2+}$	$(1.4 \pm 0.2) \times 10^8$	5-6	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. 0.01 mol L <sup>-1</sup> MeOH.	72A018
		$(1.4 \pm 0.2) \times 10^8$	6.1	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. 1 mol L <sup>-1</sup> MeOH.	77A100
		$(1.4 \pm 0.2) \times 10^8$	5.75			
		$(6 \pm 0.9) \times 10^7$	4.9			
		$(4.5 \pm 0.7) \times 10^7$	4.5			
		$< 1 \times 10^7$	3.5			
12.076	$\text{CH}_3\dot{\text{C}}\text{HO}^- + \text{Co}(\text{NH}_3)_6^{3+}$	$(8.5 \pm 1.3) \times 10^9$	12	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. 0.01 mol L <sup>-1</sup> EtOH; <i>e</i> -transfer.	72A018
	$\text{CH}_3\dot{\text{C}}\text{HOH} + \text{Co}(\text{NH}_3)_6^{3+}$	$(5.2 \pm 0.8) \times 10^7$	5-6			
12.078	$(\text{CH}_3)_2\dot{\text{C}}\text{O}^- + \text{Co}(\text{NH}_3)_6^{3+}$	$(5.0 \pm 0.8) \times 10^9$	12	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. 0.01 mol L <sup>-1</sup> 2-PrOH; <i>e</i> -transfer.	72A018
	$(\text{CH}_3)_2\dot{\text{C}}\text{HOH} + \text{Co}(\text{NH}_3)_6^{3+}$	$(1.3 \pm 0.2) \times 10^7$	5-6			
12.093	$\text{CH}_3\dot{\text{C}}\text{HOC}_2\text{H}_5 + \text{Co}(\text{NH}_3)_6^{3+}$	$< 5 \times 10^6$	5.5-6	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. ethyl ether.	77A100
12.104	$-\text{O}\dot{\text{C}}\text{HCH}_2\text{O}(\text{CH}_2)_2^- + \text{Co}(\text{NH}_3)_6^{3+}$	$< 2 \times 10^6$	3.5-4	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. dioxane.	77A100
12.107	$\text{CH}_3\text{CO}\dot{\text{C}}(\text{O}^-)\text{CH}_3 + \text{Co}(\text{NH}_3)_6^{3+}$	$< 1.8 \times 10^5$	5.5	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. 0.01 mol L <sup>-1</sup> biacetyl.	72A018
	$\text{CH}_3\text{CO}\dot{\text{C}}(\text{OH})\text{CH}_3 + \text{Co}(\text{NH}_3)_6^{3+}$	$< 2.0 \times 10^5$	1.2			
12.117	$\text{CH}_3\dot{\text{C}}(\text{O}^-)\text{CO}_2^- + \text{Co}(\text{NH}_3)_6^{3+}$	$2.4 \times 10^{10}$	12.0	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. 0.01 mol L <sup>-1</sup> lactate; <i>e</i> -transfer.	72A018
	$\text{CH}_3\dot{\text{C}}(\text{OH})\text{CO}_2^- + \text{Co}(\text{NH}_3)_6^{3+}$	$7.0 \times 10^6$	6.0			
12.127	$\cdot\text{CONH}_2 + \text{Co}(\text{NH}_3)_6^{3+}$	$< 3.6 \times 10^7$	6.2	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. 0.01 mol L <sup>-1</sup> formamide.	72A018
12.147	$\cdot\text{CO}_2^- + \text{Co}(\text{NH}_3)_6^{3+} \rightarrow$ $\text{CO}_2 + \text{Co}(\text{NH}_3)_6^{2+}$	$4.0 \times 10^7$	4.8	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. 0.01 mol L <sup>-1</sup> formate.	72A018
		$(1.1 \pm 0.3) \times 10^8$ (rel.)	6.9	p.r.	C.k. in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> formate rel. to $k(\cdot\text{CO}_2^- + \text{PNBPA}) = 1.9 \times 10^9$ . [26.147]	73A075
<b>13. Pentaammineaquacobalt(III) ion</b>						
13.075	$\cdot\text{CH}_2\text{OH} + \text{Co}(\text{NH}_3)_5\text{OH}_2^{3+} \rightarrow$ Co(II)	$(1.5 \pm 0.5) \times 10^9$ (rel.)	3.5-4	$\gamma$ -r.	Calcd. from $G(\text{Co}^{2+})$ , dose rate and $k(\text{R} + \text{R}) = 2.4 \times 10^9$ .	77A100
13.147	$\cdot\text{CO}_2^- + \text{Co}(\text{NH}_3)_5\text{OH}_2^{3+} \rightarrow$ Co(II)	$(1.7 \pm 0.3) \times 10^8$ (rel.)	5.2	p.r.	C.k. in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> formate; rel. to $k(\cdot\text{CO}_2^- + \text{PNBPA}) = 1.9 \times 10^9$ . [26.147]	73A075
<b>14. Pentaamminehydroxycobalt(III) ion</b>						
14.147	$\cdot\text{CO}_2^- + \text{Co}(\text{NH}_3)_5\text{OH}^{2+} \rightarrow$ Co(II)	$< (3 \pm 1.5) \times 10^7$ (rel.)	7.8	p.r.	C.k. in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> formate; rel. to $k(\cdot\text{CO}_2^- + \text{PNBPA}) = 1.9 \times 10^9$ . [26.147]	73A075

TABLE 1. Rate constants for reactions of aliphatic radicals with inorganic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
15.	<b>Pentaaminebromocobalt(III) ion</b>					
15.075	$\cdot\text{CH}_2\text{OH} + \text{Co}(\text{NH}_3)_5\text{Br}^{2+}$	$(9.0 \pm 1.4) \times 10^7$ $(2.5 \pm 0.4) \times 10^7$ $(2.0 \pm 0.3) \times 10^7$ $(1.8 \pm 0.3) \times 10^7$ $(1.8 \pm 0.3) \times 10^7$ $(1.8 \pm 0.3) \times 10^7$	6.1 4.9 4.5 3.5 2.0 1.0	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. 1 mol L <sup>-1</sup> MeOH.	77A100
15.076	$\text{CH}_3\dot{\text{C}}\text{HOH} + \text{Co}(\text{NH}_3)_5\text{Br}^{2+}$	$(1.5 \pm 0.2) \times 10^8$	3.5-4	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. EtOH.	77A100
15.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{Co}(\text{NH}_3)_5\text{Br}^{2+}$	$(3.0 \pm 0.45) \times 10^8$	3.5-4	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. 2-PrOH.	77A100
15.093	$\text{CH}_3\dot{\text{C}}\text{HOC}_2\text{H}_5 + \text{Co}(\text{NH}_3)_5\text{Br}^{2+}$	$(1.6 \pm 0.2) \times 10^8$	3.5-4	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. ethyl ether.	77A100
15.104	$-\text{O}\dot{\text{C}}\text{HCH}_2\text{O}(\text{CH}_2)_2\cdot + \text{Co}(\text{NH}_3)_5\text{Br}^{2+}$	$< 2 \times 10^6$	3.5-4	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. dioxane.	77A100
16.	<b>Pentaaminechlorocobalt(III) ion</b>					
16.075	$\cdot\text{CH}_2\text{OH} + \text{Co}(\text{NH}_3)_5\text{Cl}^{2+}$	$(3 \pm 1) \times 10^6$ (rel.)	3.5-4	$\gamma$ -r	Est. from effect of complex concn. on $G(\text{Co}^{2+})$ assuming $2k(\text{R} + \text{R}) = 2.4 \times 10^9$ .	77A100
16.076	$\text{CH}_3\dot{\text{C}}\text{HOH} + \text{Co}(\text{NH}_3)_5\text{Cl}^{2+}$	$(3.0 \pm 0.4) \times 10^6$	3.5-4	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. EtOH.	77A100
16.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{Co}(\text{NH}_3)_5\text{Cl}^{2+}$	$(4.0 \pm 0.6) \times 10^7$	3.5-4	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. 2-PrOH.	77A100
16.093	$\text{CH}_3\dot{\text{C}}\text{HOC}_2\text{H}_5 + \text{Co}(\text{NH}_3)_5\text{Cl}^{2+}$	$(1.4 \pm 0.2) \times 10^7$	3.5-4	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. ethyl ether.	77A100
16.104	$-\text{O}\dot{\text{C}}\text{HCH}_2\text{O}(\text{CH}_2)_2\cdot + \text{Co}(\text{NH}_3)_5\text{Cl}^{2+}$	$< 2 \times 10^6$	3.5-4	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. dioxane.	77A100
16.147	$\cdot\text{CO}_2^- + \text{Co}(\text{NH}_3)_5\text{Cl}^{2+}$	$(1.5 \pm 0.3) \times 10^8$ (rel.)	6.9	p.r.	C.k. with PNBPA assuming $k(\text{CO}_2^- + \text{PNBPA}) = 1.9 \times 10^9$ in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> formate. [26.147]	73A075
17.	<b>Pentaaminefluorocobalt(III) ion</b>					
17.075	$\cdot\text{CH}_2\text{OH} + \text{Co}(\text{NH}_3)_5\text{F}^{2+}$	$(5.5 \pm 2) \times 10^5$ (rel.)	3.5-4	$\gamma$ -r.	Est. from effect of complex concn. on $G(\text{Co}^{2+})$ assuming $2k(\text{R} + \text{R}) = 2.4 \times 10^9$ .	77A100
18.	<b>Pentaamine(nitrito-N)cobalt(III) ion</b>					
18.147	$\cdot\text{CO}_2^- + \text{Co}(\text{NH}_3)_5\text{NO}_2^{2+}$	$< (2 \pm 1) \times 10^7$ (rel.)	6.9	p.r.	C.k. with PNBPA assuming $k(\text{CO}_2^- + \text{PNBPA}) = 1.9 \times 10^9$ in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> formate. [26.147]	73A075
19.	<b>Pentaamine(nitrato-O)cobalt(III) ion</b>					
19.147	$\cdot\text{CO}_2^- + \text{Co}(\text{NH}_3)_5\text{NO}_3^{2+}$	$(2.1 \pm 0.3) \times 10^8$ (rel.)	6.9	p.r.	C.k. with PNBPA assuming $k(\text{CO}_2^- + \text{PNBPA}) = 1.9 \times 10^9$ in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> formate. [26.147]	73A075
20.	<b>(Acetato)pentaaminocobalt(III) ion</b>					
20.001	$\cdot\text{CH}_3 + \text{Co}(\text{NH}_3)_5\text{O}_2\text{CCH}_3^{2+} \rightarrow$ $\text{CH}_4 + \text{Co}^{2+} + 4\text{NH}_4^+ + \text{NH}_2^+ +$ $\text{CH}_3\text{CO}_2\text{H}$	$(4 \pm 1) \times 10^3$ (rel.)		phot.	Est. from intensity dependence of CH <sub>4</sub> and C <sub>2</sub> H <sub>6</sub> formn. assuming $k(\text{R} + \text{R}) = 2 \times 10^{10}$ .	71F579
20.147	$\cdot\text{CO}_2^- + \text{Co}(\text{NH}_3)_5\text{O}_2\text{CCH}_3^{2+}$	$(1.1 \pm 0.3) \times 10^8$ (rel.)	6.9	p.r.	C.k. with PNBPA assuming $k(\text{CO}_2^- + \text{PNBPA}) = 1.9 \times 10^9$ in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> formate. [26.147]	73A075
21.	<b>Pentaamine(phenylacetato)cobalt(III) ion</b>					
21.147	$\cdot\text{CO}_2^- + \text{Co}(\text{NH}_3)_5\text{O}_2\text{CCH}_2\text{C}_6\text{H}_5^{2+}$	$(7.0 \pm 2) \times 10^7$ (rel.)	6.9	p.r.	C.k. with PNBPA assuming $k(\text{CO}_2^- + \text{PNBPA}) = 1.9 \times 10^9$ in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> formate. [26.147]	73A075



TABLE 1. Rate constants for reactions of aliphatic radicals with inorganic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
22.	<b>Pentaammine(4-nitrophenylacetato)cobalt(III) ion</b>					
22.147	$\cdot\text{CO}_2^- + \text{Co}(\text{NH}_3)_5\text{O}_2\text{CCH}_2\text{C}_6\text{H}_4\text{NO}_2^{2+}$	$(1.2 \pm 0.1) \times 10^9$ (rel.)	6.9	p.r.	C.k. with PNBPA assuming $k(\text{CO}_2^- + \text{PNBPA}) = 1.9 \times 10^9$ in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> formate. [26.147]	73A075
23.	<b>Pentaammine(benzoato)cobalt(III) ion</b>					
23.147	$\cdot\text{CO}_2^- + \text{Co}(\text{NH}_3)_5\text{O}_2\text{CC}_6\text{H}_5^{2+}$	$(4.5 \pm 2) \times 10^7$ (rel.)	6.9	p.r.	C.k. with PNBPA assuming $k(\text{CO}_2^- + \text{PNBPA}) = 1.9 \times 10^9$ in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> formate. [26.147]	73A075
24.	<b>Pentaammine(2-nitrobenzoato)cobalt(III) ion</b>					
24.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} +$ $\text{Co}(\text{NH}_3)_5\text{O}_2\text{CC}_6\text{H}_4\text{NO}_2^{2+}$	$1.7 \times 10^9$	7.0	p.r.	P.b.k.	77A027
24.147	$\cdot\text{CO}_2^- + \text{Co}(\text{NH}_3)_5\text{O}_2\text{CC}_6\text{H}_4\text{NO}_2^{2+}$	$2.0 \times 10^9$	7.0	p.r.	P.b.k.	77A027
25.	<b>Pentaammine(3-nitrobenzoato)cobalt(III) ion</b>					
25.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} +$ $\text{Co}(\text{NH}_3)_5\text{O}_2\text{CC}_6\text{H}_4\text{NO}_2^{2+}$	$1.5 \times 10^9$	7.0	p.r.	P.b.k.	77A027
25.147	$\cdot\text{CO}_2^- + \text{Co}(\text{NH}_3)_5\text{O}_2\text{CC}_6\text{H}_4\text{NO}_2^{2+}$	$1.5 \times 10^9$	7.0	p.r.	P.b.k.	77A027
26.	<b>Pentaammine(4-nitrobenzoato)cobalt(III) ion (PNBPA)</b>					
26.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} +$ $\text{Co}(\text{NH}_3)_5\text{O}_2\text{CC}_6\text{H}_4\text{NO}_2^{2+} \rightarrow$ $(\text{CH}_3)_2\dot{\text{C}}\text{O} + \text{H}^+ +$ $\text{Co}^{\text{III}}(\text{NH}_3)_5\text{O}_2\text{CC}_6\text{H}_4\dot{\text{N}}\text{O}_2^-$	$2.6 \times 10^9$ $2.6 \times 10^9$	4.5 7.0	p.r. p.r.	Condy. in N <sub>2</sub> O-satd. soln. contg. 0.2 mol L <sup>-1</sup> 2-PrOH. P.b.k.	74A002 77A027
26.147	$\cdot\text{CO}_2^- + \text{Co}(\text{NH}_3)_5\text{O}_2\text{CC}_6\text{H}_4\text{NO}_2^{2+} \rightarrow$ $\text{CO}_2 + \text{Co}^{\text{III}}(\text{NH}_3)_5\text{O}_2\text{CC}_6\text{H}_4\dot{\text{N}}\text{O}_2^-$	$1.9 \times 10^9$	7.0	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> formate.	72G340 77A027
27.	<b>Pentaammine(2,4-dinitrobenzoato)cobalt(III) ion</b>					
27.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} +$ $\text{Co}(\text{NH}_3)_5\text{O}_2\text{CC}_6\text{H}_3(\text{NO}_2)_2^{2+}$	$4.3 \times 10^9$	7.0	p.r.	P.b.k.	77A027
27.147	$\cdot\text{CO}_2^- + \text{Co}(\text{NH}_3)_5\text{O}_2\text{CC}_6\text{H}_3(\text{NO}_2)_2^{2+}$	$7.5 \times 10^9$	7.0	p.r.	P.b.k.	77A027
28.	<b>Pentaammine(3,5-dinitrobenzoato)cobalt(III) ion</b>					
28.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} +$ $\text{Co}(\text{NH}_3)_5\text{O}_2\text{CC}_6\text{H}_3(\text{NO}_2)_2^{2+}$	$2.9 \times 10^9$	7.0	p.r.	P.b.k.	77A027
28.147	$\cdot\text{CO}_2^- + \text{Co}(\text{NH}_3)_5\text{O}_2\text{CC}_6\text{H}_3(\text{NO}_2)_2^{2+}$	$8.1 \times 10^9$	7.0	p.r.	P.b.k.	77A027
29.	<b>Hexaamminebis(<math>\mu</math>-hydroxy)[<math>\mu</math>-(4-nitrobenzoato)]dicobalt(III) ion</b>					
29.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \dots\text{NO}_2 \rightarrow$ $(\text{CH}_3)_2\dot{\text{C}}\text{O} + \text{H}^+ + \dots\dot{\text{N}}\text{O}_2^-$	$(2 \pm 0.4) \times 10^9$ $(1.4 \pm 0.4) \times 10^9$	0.7– 6.0	p.r. p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. 1 mol L <sup>-1</sup> 2-PrOH. P.b.k. at 370 nm in soln. contg. 1% 2-PrOH; $\Delta H^\ddagger = 3.1 \pm 2.0$ kcal mol <sup>-1</sup> (13 kJ mol <sup>-1</sup> ); $k$ decreases with concn. of 2-PrOH; $k = 1.25 \times 10^9$ in 99% D <sub>2</sub> O– 1% 2-PrOH.	78A108 80A066
29.101	$\cdot\text{CHOHCH}_2\text{OH} + \dots\text{NO}_2 \rightarrow \dots\dot{\text{N}}\text{O}_2$	$(8 \pm 2) \times 10^7$		p.r.	P.b.k. at 370 nm in soln. of 50% H <sub>2</sub> O–50% ethylene glycol; $\Delta H^\ddagger =$ $5.4 \pm 0.3$ kcal mol <sup>-1</sup> (21 kJ mol <sup>-1</sup> )	80A066
30.	<b>Pentaammine(4-cyanobenzoato)cobalt(III) ion</b>					
30.147	$\cdot\text{CO}_2^- + \text{Co}(\text{NH}_3)_5\text{O}_2\text{CC}_6\text{H}_4\text{CN}^{2+}$	$(4.6 \pm 2) \times 10^7$ (rel.)	6.9	p.r.	C.k. with PNBPA assuming $k(\text{CO}_2^- + \text{PNBPA}) = 1.9 \times 10^9$ in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> formate. [26.147]	73A075
31.	<b>Pentaammine(pyridine)cobalt(III) ion</b>					
31.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{Co}(\text{NH}_3)_5\text{C}_5\text{H}_5\text{N}^{3+} \rightarrow$ $\text{Co}^{2+} + 5\text{NH}_3 + \text{C}_5\text{H}_5\text{N}$ $+ (\text{CH}_3)_2\dot{\text{C}}\text{O} + \text{H}^+$	$\sim 10^9$	1–7	$\gamma$ -r.	Est. from $G(\text{Co}^{2+})$ in N <sub>2</sub> O-satd. soln. contg. 1 mol L <sup>-1</sup> 2-PrOH.	79A213

TABLE 1. Rate constants for reactions of aliphatic radicals with inorganic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
31.147	$\cdot\text{CO}_2^- + \text{Co}(\text{NH}_3)_5\text{C}_5\text{H}_5\text{N}^{3+}$	$(3.3 \pm 0.4) \times 10^8$ (rel.)	6.9	p.r.	C.k. with PNBPA assuming $k(\text{CO}_2^- + \text{PNBPA}) = 1.9 \times 10^9$ in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> formate. [26.147]	73A075
32.	<b>Pentaammine(pyridinecarboxylato)cobalt(III) ion</b>					
32.147	$\cdot\text{CO}_2^- + \text{Co}(\text{NH}_3)_5\text{O}_2\text{CC}_5\text{H}_4\text{N}^{2+}$	$(5.1 \pm 2) \times 10^7$ (rel.)	6.9	p.r.	C.k. with PNBPA assuming $k(\text{CO}_2^- + \text{PNBPA}) = 1.9 \times 10^9$ in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> formate. [26.147]	73A075
33.	<b>Pentaammine(pyrazinecarboxylato)cobalt(III) ion</b>					
33.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} +$ $\text{Co}(\text{NH}_3)_5\text{O}_2\text{CC}_4\text{H}_3\text{N}_2^{2+} \rightarrow$ $(\text{CH}_3)_2\text{CO} + \dots\dot{\text{N}}\text{H}$	$(4.0 \pm 0.6) \times 10^8$	0-5	p.r.	P.b.k. in N <sub>2</sub> O or Ar-satd. soln. contg. 1 mol L <sup>-1</sup> 2-PrOH.	78A222
34.	<b>Tetraammine(pyrazinecarboxylato-O,N)cobalt(III) ion</b>					
34.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} +$ $\text{Co}(\text{NH}_3)_4\text{O}_2\text{CC}_4\text{H}_3\text{N}_2^{2+} \rightarrow$ $(\text{CH}_3)_2\text{CO} + \text{Co}^{\text{II}}$	$(9 \pm 2) \times 10^8$	5	p.r.	P.b.k. in N <sub>2</sub> O or Ar-satd. soln. contg. 1 mol L <sup>-1</sup> 2-PrOH.	78A222
35.	<b>Hexaamminebis(<math>\mu</math>-hydroxy)[<math>\mu</math>-(pyrazinecarboxylato)](dicobalt(III) ion</b>					
35.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \dots\text{N} \rightarrow$ $(\text{CH}_3)_2\text{CO} + \dots\dot{\text{N}}\text{H}$	$(4.2 \pm 0.4) \times 10^8$	0-6	p.r.	P.b.k. in N <sub>2</sub> O or Ar-satd. soln. contg. 1 mol L <sup>-1</sup> 2-PrOH.	78A222
36.	<b>Tris(ethylenediamine)cobalt(III) ion</b>					
36.075	$\cdot\text{CH}_2\text{OH} + \text{Co}(\text{en})_3^{3+}$	no reaction	3.5-4	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. MeOH.	77A100
36.076	$\text{CH}_3\dot{\text{C}}\text{HOH} + \text{Co}(\text{en})_3^{3+}$	no reaction	3.5-4	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. EtOH.	77A100
36.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{Co}(\text{en})_3^{3+}$	no reaction	3.5-4	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. 2-PrOH.	77A100
37.	<b>cis-Aminechlorobis(ethylenediamine)cobalt(III) ion</b>					
37.075	$\cdot\text{CH}_2\text{OH} + \text{Co}(\text{NH}_3)\text{Cl}(\text{en})_2^{2+}$	$< 2 \times 10^6$	3.5-4	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. MeOH.	77A100
37.076	$\text{CH}_3\dot{\text{C}}\text{HOH} + \text{Co}(\text{NH}_3)\text{Cl}(\text{en})_2^{2+}$	$4.2 \times 10^6$	3.5-4	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. EtOH.	77A100
37.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{Co}(\text{NH}_3)\text{Cl}(\text{en})_2^{2+}$	$2.2 \times 10^7$	3.5-4	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. 2-PrOH.	77A100
37.093	$\text{CH}_3\dot{\text{C}}\text{HOC}_2\text{H}_5 + \text{Co}(\text{NH}_3)\text{Cl}(\text{en})_2^{2+}$	$4.6 \times 10^6$	3.5-4	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. Et <sub>2</sub> O.	77A100
38.	<b>cis-Aquachlorobis(ethylenediamine)cobalt(III) ion</b>					
38.075	$\cdot\text{CH}_2\text{OH} + \text{Co}(\text{OH}_2)\text{Cl}(\text{en})_2^{2+}$	$(1.8 \pm 0.5) \times 10^6$	3.5-4	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. MeOH.	77A100
38.076	$\text{CH}_3\dot{\text{C}}\text{HOH} + \text{Co}(\text{OH}_2)\text{Cl}(\text{en})_2^{2+}$	$2.0 \times 10^7$	3.5-4	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. EtOH.	77A100
38.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{Co}(\text{OH}_2)\text{Cl}(\text{en})_2^{2+}$	$8.2 \times 10^7$	3.5-4	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. 2-PrOH.	77A100
38.093	$\text{CH}_3\dot{\text{C}}\text{HOC}_2\text{H}_5 + \text{Co}(\text{OH}_2)\text{Cl}(\text{en})_2^{2+}$	$3.5 \times 10^7$	3.5-4	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. Et <sub>2</sub> O.	77A100
39.	<b>trans-Dibromobis(ethylenediamine)cobalt(III) ion</b>					
39.075	$\cdot\text{CH}_2\text{OH} + \text{Co}(\text{en})_2\text{Br}_2^+$	$2.6 \times 10^8$	3.5-4	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. MeOH.	77A100
39.076	$\text{CH}_3\dot{\text{C}}\text{HOH} + \text{Co}(\text{en})_2\text{Br}_2^+$	$5.7 \times 10^8$	3.5-4	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. EtOH.	77A100
39.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{Co}(\text{en})_2\text{Br}_2^+$	$6.8 \times 10^8$	3.5-4	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. 2-PrOH.	77A100
39.093	$\text{CH}_3\dot{\text{C}}\text{HOC}_2\text{H}_5 + \text{Co}(\text{en})_2\text{Br}_2^+$	$6.5 \times 10^8$	3.5-4	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. Et <sub>2</sub> O.	77A100
39.104	$-\text{O}\dot{\text{C}}\text{HCH}_2\text{O}(\text{CH}_2)_2- + \text{Co}(\text{en})_2\text{Br}_2^+$	$4.4 \times 10^8$	3.5-4	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. dioxane.	77A100
40.	<b>cis-Bromobis(ethylenediamine)fluorocobalt(III) ion</b>					
40.075	$\cdot\text{CH}_2\text{OH} + \text{CoBr}(\text{en})_2\text{F}^+$	$< 2 \times 10^6$	3.5-4	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. MeOH.	77A100
40.076	$\text{CH}_3\dot{\text{C}}\text{HOH} + \text{CoBr}(\text{en})_2\text{F}^+$	$2.8 \times 10^7$	3.5-4	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. EtOH.	77A100
40.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{CoBr}(\text{en})_2\text{F}^+$	$1.1 \times 10^8$	3.5-4	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. 2-PrOH.	77A100
40.093	$\text{CH}_3\dot{\text{C}}\text{HOC}_2\text{H}_5 + \text{CoBr}(\text{en})_2\text{F}^+$	$4.9 \times 10^7$	3.5-4	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. Et <sub>2</sub> O.	77A100
41.	<b>cis-Dichlorobis(ethylenediamine)cobalt(III) ion</b>					
41.075	$\cdot\text{CH}_2\text{OH} + \text{CoCl}_2(\text{en})_2^+$	$< 5 \times 10^6$	3.5-4	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. MeOH.	77A100

TABLE I. Rate constants for reactions of aliphatic radicals with inorganic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
41.076	CH <sub>3</sub> ĊHOH + CoCl <sub>2</sub> (en) <sub>2</sub> <sup>+</sup>	3.8 x 10 <sup>7</sup>	3.5-4	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. EtOH.	77A100
41.078	(CH <sub>3</sub> ) <sub>2</sub> ĊOH + CoCl <sub>2</sub> (en) <sub>2</sub> <sup>+</sup>	1.0 x 10 <sup>8</sup>	3.5-4	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. 2-PrOH.	77A100
42.	<b>trans-Dichlorobis(ethylenediamine)cobalt(III) ion</b>					
42.075	·CH <sub>2</sub> OH + CoCl <sub>2</sub> (en) <sub>2</sub> <sup>+</sup>	(8 ± 2) x 10 <sup>6</sup>	3.5-4	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. MeOH.	77A100
42.076	CH <sub>3</sub> ĊHOH + CoCl <sub>2</sub> (en) <sub>2</sub> <sup>+</sup>	1.5 x 10 <sup>8</sup>	3.5-4	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. EtOH.	77A100
42.078	(CH <sub>3</sub> ) <sub>2</sub> ĊOH + CoCl <sub>2</sub> (en) <sub>2</sub> <sup>+</sup>	3.8 x 10 <sup>8</sup>	3.5-4	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. 2-PrOH.	77A100
42.093	CH <sub>3</sub> ĊHOC <sub>2</sub> H <sub>5</sub> + CoCl <sub>2</sub> (en) <sub>2</sub> <sup>+</sup>	1.5 x 10 <sup>8</sup>	3.5-4	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. Et <sub>2</sub> O.	77A100
42.104	-OĊHCH <sub>2</sub> O(CH <sub>2</sub> ) <sub>2</sub> - + CoCl <sub>2</sub> (en) <sub>2</sub> <sup>+</sup>	3.5 x 10 <sup>7</sup>	3.5-4	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. dioxane.	77A100
43.	<b>trans-Bis(ethylenediamine)difluorocobalt(III) ion</b>					
43.075	·CH <sub>2</sub> OH + CoF <sub>2</sub> (en) <sub>2</sub> <sup>+</sup>	no reaction	3.5-4	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. MeOH.	77A100
43.076	CH <sub>3</sub> ĊHOH + CoF <sub>2</sub> (en) <sub>2</sub> <sup>+</sup>	no reaction	3.5-4	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. EtOH.	77A100
43.078	(CH <sub>3</sub> ) <sub>2</sub> ĊOH + CoF <sub>2</sub> (en) <sub>2</sub> <sup>+</sup>	no reaction	3.5-4	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. 2-PrOH.	77A100
44.	<b>Tris(2,2'-bipyridine)cobalt(III) ion</b>					
44.075	·CH <sub>2</sub> OH + Co(bpy) <sub>3</sub> <sup>3+</sup> → Co(bpy) <sub>3</sub> <sup>2+</sup>	2 x 10 <sup>8</sup>	1,7	p.r.	P.b.k. at 326 nm in N <sub>2</sub> O-satd. soln. contg. 0.25 mol L <sup>-1</sup> MeOH.	79A034
44.078	(CH <sub>3</sub> ) <sub>2</sub> ĊOH + Co(bpy) <sub>3</sub> <sup>3+</sup> → Co(bpy) <sub>3</sub> <sup>2+</sup>	(2.5 ± 0.3) x 10 <sup>9</sup>	0.5, 7.8	p.r.	P.b.k. at 330 nm in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> 2-PrOH.	79A034
44.147	·CO <sub>2</sub> <sup>-</sup> + Co(bpy) <sub>3</sub> <sup>3+</sup> → Co(bpy) <sub>3</sub> <sup>2+</sup>	(7.6 ± 0.2) x 10 <sup>9</sup> (rel.)	6.9	p.r.	C.k. with PNBPA assuming $k(\text{CO}_2^- + \text{PNBPA}) = 1.9 \times 10^9$ in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> formate. [26.147]	73A075
		(7.8 ± 0.5) x 10 <sup>9</sup>	6.9	p.r.	P.b.k. at 330 nm in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> formate.	79A034
45.	<b>Tris(1,10-phenanthroline)cobalt(III) ion</b>					
45.075	·CH <sub>2</sub> OH + Co(phen) <sub>3</sub> <sup>3+</sup> → addn. to ligand	8 x 10 <sup>8</sup>	1-7	p.r.	P.b.k. at 475 nm in N <sub>2</sub> O-satd. soln. contg. 2.5 mol L <sup>-1</sup> MeOH; c.k. with O <sub>2</sub> gave (7 ± 1) x 10 <sup>8</sup> assuming $k(\text{R} + \text{O}_2) = 4.2 \times 10^9$ .	80A227
45.076	CH <sub>3</sub> ĊHOH + Co(phen) <sub>3</sub> <sup>3+</sup> → addn. to ligand	3.8 x 10 <sup>9</sup>	1-7	p.r.	P.b.k. at 475 nm in N <sub>2</sub> O-satd. soln. contg. 0.25 mol L <sup>-1</sup> EtOH.	80A227
45.078	(CH <sub>3</sub> ) <sub>2</sub> ĊOH + Co(phen) <sub>3</sub> <sup>3+</sup> → Co(phen) <sub>3</sub> <sup>2+</sup>	4.6 x 10 <sup>9</sup>	7.0	p.r.	P.b.k. at 360 nm in N <sub>2</sub> O-satd. soln. contg. 0.5 mol L <sup>-1</sup> 2-PrOH.	79A034
45a.	<b>Tris(5,6-dimethyl-1,10-phenanthroline)cobalt(III) ion</b>					
45a.075	·CH <sub>2</sub> OH + Co(5,6-Me <sub>2</sub> phen) <sub>3</sub> <sup>3+</sup> → Co(5,6-Me <sub>2</sub> phen) <sub>3</sub> <sup>2+</sup>	4.9 x 10 <sup>8</sup>	~7	p.r.	P.b.k., as well as d.k. at 380 nm in N <sub>2</sub> O-satd. soln. contg. 2.5 mol L <sup>-1</sup> MeOH.	80A227
45a.076	CH <sub>3</sub> ĊHOH + Co(5,6-Me <sub>2</sub> phen) <sub>3</sub> <sup>3+</sup> → Co(5,6-Me <sub>2</sub> phen) <sub>3</sub> <sup>2+</sup>	3.1 x 10 <sup>9</sup>	~7	p.r.	P.b.k., as well as d.k. at 380 nm in N <sub>2</sub> O-satd. soln. contg. 0.25 mol L <sup>-1</sup> EtOH.	80A227
45a.078	(CH <sub>3</sub> ) <sub>2</sub> ĊOH + Co(5,6-Me <sub>2</sub> phen) <sub>3</sub> <sup>3+</sup> → Co(5,6-Me <sub>2</sub> phen) <sub>3</sub> <sup>2+</sup>	3.2 x 10 <sup>9</sup>	~7	p.r.	P.b.k., as well as d.k. at 380 nm in N <sub>2</sub> O-satd. soln. contg. 0.25 mol L <sup>-1</sup> 2-PrOH; same product from e <sub>aq</sub> <sup>-</sup> reaction.	80A227
46.	<b>Diaqua(5,7,7,12,14,14-hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-diene)cobalt(III) ion</b>					
46.078	(CH <sub>3</sub> ) <sub>2</sub> ĊOH + Co <sup>III</sup> → Co <sup>II</sup>	2.0 x 10 <sup>8</sup>	2.0	p.r.	P.b.k.	76A203
46.147	·CO <sub>2</sub> <sup>-</sup> + Co <sup>III</sup> → Co <sup>II</sup>	8.1 x 10 <sup>8</sup>	2.5	p.r.	P.b.k.	76A203
47.	<b>Aqua(5,7,7,12,14,14-hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-diene)hydroxycobalt(III) ion</b>					
47.078	(CH <sub>3</sub> ) <sub>2</sub> ĊOH + Co <sup>III</sup> → Co <sup>II</sup>	1.1 x 10 <sup>8</sup>	6.0	p.r.	P.b.k.	76A203
48.	<b>(5,7,7,12,14,14-hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-diene)dihydroxycobalt(III) ion</b>					
48.078	(CH <sub>3</sub> ) <sub>2</sub> ĊOH + Co <sup>III</sup> → Co <sup>II</sup>	1.1 x 10 <sup>8</sup>	10.0	p.r.	P.b.k.	76A203

TABLE I. Rate constants for reactions of aliphatic radicals with inorganic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
49.	<b>Dichloro(5,7,7,12,14-hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-diene)cobalt(III) ion</b>					
49.078	(CH <sub>3</sub> ) <sub>2</sub> ĊOH + Co <sup>III</sup> → Co <sup>II</sup>	7.0 × 10 <sup>8</sup>	1.0	p.r.	P.b.k.	76A203
49.147	·CO <sub>2</sub> <sup>-</sup> + Co <sup>III</sup> → Co <sup>II</sup>	1.1 × 10 <sup>9</sup>	2.5	p.r.	P.b.k.	76A203
50.	<b>Diaqua(2,3,9,10-tetramethyl-1,4,8,11-tetraazacyclotetradeca-1,3,8,10-tetraene)cobalt(III) ion</b>					
50.078	(CH <sub>3</sub> ) <sub>2</sub> ĊOH + Co <sup>III</sup> → Co <sup>II</sup>	1.9 × 10 <sup>9</sup>	1.0	p.r.	P.b.k.	76A203
50.147	·CO <sub>2</sub> <sup>-</sup> + Co <sup>III</sup> → Co <sup>II</sup>	6.4 × 10 <sup>9</sup>	2.5	p.r.	P.b.k.	76A203
51.	<b>Aquahydroxy(2,3,9,10-tetramethyl-1,4,8,11-tetraazacyclotetradeca-1,3,8,10-tetraene)cobalt(III) ion</b>					
51.078	(CH <sub>3</sub> ) <sub>2</sub> ĊOH + Co <sup>III</sup> → Co <sup>II</sup>	5.5 × 10 <sup>8</sup>	5.0	p.r.	P.b.k.	76A203
52.	<b>Dihydroxy(2,3,9,10-tetramethyl-1,4,8,11-tetraazacyclotetradeca-1,3,8,10-tetraene)cobalt(III) ion</b>					
52.078	(CH <sub>3</sub> ) <sub>2</sub> ĊOH + Co <sup>III</sup> → Co <sup>II</sup>	3.3 × 10 <sup>9</sup>	9.0	p.r.	P.b.k.	76A203
53.	<b>Cyanocob(III)alamin(Vitamin B12)</b>					
53.147	·CO <sub>2</sub> <sup>-</sup> + B12 → B12r (B12r See 10.)	1.2 × 10 <sup>9</sup>	6.0	p.r.	P.b.k. at 530 nm as well as d.k. at 390 nm in soln. contg. 0.1 mol L <sup>-1</sup> <i>tert</i> -BuOH, satd. with CO <sub>2</sub> .	73G116
		no reaction		p.r.	No change in o.d. in N <sub>2</sub> O or CO <sub>2</sub> -satd. soln. contg. 0.1 mol L <sup>-1</sup> formate, or CO <sub>2</sub> -satd. soln. contg. 0.1 mol L <sup>-1</sup> <i>tert</i> -BuOH.	74A105
54.	<b>Hydroxocob(III)alamin(Vitamin B12a)</b>					
54.147	·CO <sub>2</sub> <sup>-</sup> + B12a → B12r (B12r See 10.)	1.45 × 10 <sup>9</sup>	9.2	p.r.	D.k. at 350 nm as well as p.b.k. at 310 nm in CO <sub>2</sub> -satd. soln. contg. <i>tert</i> -BuOH.	74A105
	<b>Cr</b>					
55.	<b>Chromium(II) ion</b>					
55.006	·CH <sub>2</sub> C(CH <sub>3</sub> ) <sub>2</sub> CO <sub>2</sub> H + Cr(H <sub>2</sub> O) <sub>6</sub> <sup>2+</sup> → (H <sub>2</sub> O) <sub>5</sub> Cr <sup>III</sup> CH <sub>2</sub> C(CH <sub>3</sub> ) <sub>2</sub> CO <sub>2</sub> H	1.1 × 10 <sup>8</sup>	~1	p.r.	P.b.k. in Ar-satd. soln. contg. pivalic acid-HClO <sub>4</sub> .	74A146
55.016	·CH <sub>2</sub> C(CH <sub>3</sub> ) <sub>2</sub> OH + Cr(H <sub>2</sub> O) <sub>6</sub> <sup>2+</sup> → (H <sub>2</sub> O) <sub>5</sub> Cr <sup>III</sup> CH <sub>2</sub> C(CH <sub>3</sub> ) <sub>2</sub> OH	1.0 × 10 <sup>8</sup>	~1	p.r.	P.b.k. in Ar-satd. soln. contg. <i>tert</i> -BuOH-HClO <sub>4</sub> .	74A146
55.020	·CH <sub>2</sub> CHO + Cr(H <sub>2</sub> O) <sub>6</sub> <sup>2+</sup> → (H <sub>2</sub> O) <sub>5</sub> Cr <sup>III</sup> CH <sub>2</sub> CH(OH) <sub>2</sub>	(3.5 ± 0.5) × 10 <sup>8</sup>	~1	p.r.	P.b.k. in Ar-satd. soln. contg. ethylene glycol-HClO <sub>4</sub> ; ·CHOHCH <sub>2</sub> OH loses water in acid soln.	74A146
55.035	·CH <sub>2</sub> CO <sub>2</sub> H + Cr(H <sub>2</sub> O) <sub>6</sub> <sup>2+</sup> → (H <sub>2</sub> O) <sub>5</sub> Cr <sup>III</sup> CH <sub>2</sub> CO <sub>2</sub> H	2.5 × 10 <sup>8</sup>	~1	p.r.	P.b.k. in Ar-satd. soln. contg. acetic acid-HClO <sub>4</sub> .	74A146
55.037	CH <sub>3</sub> ĊHCO <sub>2</sub> H + Cr(H <sub>2</sub> O) <sub>6</sub> <sup>2+</sup> → (H <sub>2</sub> O) <sub>5</sub> Cr <sup>III</sup> CH(CH <sub>3</sub> )CO <sub>2</sub> H	1.1 × 10 <sup>8</sup>	~1	p.r.	P.b.k. in Ar-satd. soln. contg. propionic acid-HClO <sub>4</sub> .	74A146
55.042	·CH(CO <sub>2</sub> H) <sub>2</sub> + Cr(H <sub>2</sub> O) <sub>6</sub> <sup>2+</sup> → (H <sub>2</sub> O) <sub>5</sub> Cr <sup>III</sup> CH(CO <sub>2</sub> H) <sub>2</sub>	6.0 × 10 <sup>7</sup>	~1	p.r.	P.b.k. in Ar-satd. soln. contg. malonic acid-HClO <sub>4</sub> .	74A146
55.054	HCON(CH <sub>3</sub> )CH <sub>2</sub> + Cr(H <sub>2</sub> O) <sub>6</sub> <sup>2+</sup> → (H <sub>2</sub> O) <sub>5</sub> Cr <sup>III</sup> CH <sub>2</sub> N(CH <sub>3</sub> )CHO	(1.1 ± 0.1) × 10 <sup>8</sup>	~5	p.r.	P.b.k. in Ar or N <sub>2</sub> O-satd. soln. contg. dimethylformamide.	74A146
55.075	·CH <sub>2</sub> OH + Cr(H <sub>2</sub> O) <sub>6</sub> <sup>2+</sup> → (H <sub>2</sub> O) <sub>5</sub> Cr <sup>III</sup> CH <sub>2</sub> OH	1.6 × 10 <sup>8</sup>	~1	p.r.	P.b.k. in Ar-satd. soln. contg. MeOH-HClO <sub>4</sub> .	74A146
55.076	CH <sub>3</sub> ĊHOH + Cr(H <sub>2</sub> O) <sub>6</sub> <sup>2+</sup> → (H <sub>2</sub> O) <sub>5</sub> Cr <sup>III</sup> CHOHCH <sub>3</sub>	7.9 × 10 <sup>7</sup>	~1	p.r.	P.b.k. in Ar-satd. soln. contg. EtOH-HClO <sub>4</sub> .	74A146
55.078	(CH <sub>3</sub> ) <sub>2</sub> ĊOH + Cr(H <sub>2</sub> O) <sub>6</sub> <sup>2+</sup> → (H <sub>2</sub> O) <sub>5</sub> Cr <sup>III</sup> C(CH <sub>3</sub> ) <sub>2</sub> OH	5.1 × 10 <sup>7</sup>	~1	p.r.	P.b.k. in Ar-satd. soln. contg. 2-PrOH-HClO <sub>4</sub> .	74A146
55.093	CH <sub>3</sub> ĊHOC <sub>2</sub> H <sub>5</sub> + Cr(H <sub>2</sub> O) <sub>6</sub> <sup>2+</sup> → (H <sub>2</sub> O) <sub>5</sub> Cr <sup>III</sup> CH(CH <sub>3</sub> )OC <sub>2</sub> H <sub>5</sub>	3.4 × 10 <sup>7</sup>	~1	p.r.	P.b.k. in Ar-satd. soln. contg. Et <sub>2</sub> O-HClO <sub>4</sub> .	74A146
55.101	·CHOHCH <sub>2</sub> OH + Cr(H <sub>2</sub> O) <sub>6</sub> <sup>2+</sup> → (H <sub>2</sub> O) <sub>5</sub> Cr <sup>III</sup> CH <sub>2</sub> CH(OH) <sub>2</sub>	(1.5 ± 0.2) × 10 <sup>8</sup>	3.0- 4.5	p.r.	P.b.k. in Ar-satd. soln. contg. ethylene glycol-HClO <sub>4</sub> ; product same as in 55.020.	74A146
55.104	-OĊHCH <sub>2</sub> O(CH <sub>2</sub> ) <sub>2</sub> - + Cr(H <sub>2</sub> O) <sub>6</sub> <sup>2+</sup> → (H <sub>2</sub> O) <sub>5</sub> Cr <sup>III</sup> R	1.0 × 10 <sup>8</sup>	~1	p.r.	P.b.k. in Ar-satd. soln. contg. dioxane-HClO <sub>4</sub> .	74A146
55.115	·CHOHCO <sub>2</sub> H + Cr(H <sub>2</sub> O) <sub>6</sub> <sup>2+</sup> → (H <sub>2</sub> O) <sub>5</sub> Cr <sup>III</sup> CHOHCO <sub>2</sub> H	1.4 × 10 <sup>8</sup>	~1	p.r.	P.b.k. in Ar-satd. soln. contg. glycolic acid-HClO <sub>4</sub> .	74A146

TABLE 1. Rate constants for reactions of aliphatic radicals with inorganic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
55.117	$\text{CH}_3\dot{\text{C}}\text{OHC}\text{O}_2\text{H} + \text{Cr}(\text{H}_2\text{O})_6^{2+} \rightarrow$ $(\text{H}_2\text{O})_5\text{Cr}^{\text{III}}\text{COH}(\text{CH}_3)\text{CO}_2\text{H}$	$9.2 \times 10^7$	~1	p.r.	P.b.k. in Ar-satd. soln. contg. lactic acid-HClO <sub>4</sub> .	74A146
55.127	$\cdot\text{CONH}_2 + \text{Cr}(\text{H}_2\text{O})_6^{2+} \rightarrow$ $(\text{H}_2\text{O})_5\text{Cr}^{\text{III}}\text{CONH}_2$	$(6.5 \pm 0.6) \times 10^8$	~5	p.r.	P.b.k. in Ar- or N <sub>2</sub> O-satd. soln. contg. formamide.	74A146
55.147	$\cdot\text{CO}_2^-(\text{CO}_2\text{H}) + \text{Cr}^{\text{III}} \rightarrow \text{Cr}^{\text{III}}\text{CO}_2^-$	$(1.1 \pm 0.1) \times 10^9$	1.4	p.r.	D.k. in soln. contg. 1 mol L <sup>-1</sup> formic acid; product spectrum similar to products containing C-Cr bonds [74A146].	73A057
56.	<b>Chromium(III) ion</b>					
56.147	$\cdot\text{CO}_2^-(\text{CO}_2\text{H}) + \text{Cr}^{\text{III}}$	no reaction	1.4	p.r.	D.k. in soln. contg. 1 mol L <sup>-1</sup> formic acid.	73A057
	<b>Cu</b>					
57.	<b>Copper(I) ions</b>					
57.014	$\cdot\text{CH}_2\text{CH}_2\text{OH} + \text{Cu}^+ \rightarrow \text{Cu}^{\text{II}}\text{CH}_2\text{CH}_2\text{OH}^+$ $\rightarrow \text{Cu}^{2+} + \text{C}_2\text{H}_4 + \text{OH}^-$	$(1.9 \pm 0.6) \times 10^{10}$	4.5	p.r.	Est. from p.b.k. in N <sub>2</sub> O-satd. soln. contg. ethylene and Cu <sup>2+</sup> .	78A322
57.016	$\cdot\text{CH}_2\text{C}(\text{CH}_3)_2\text{OH} + \text{Cu}^+ \rightarrow$ $\text{Cu}^{\text{II}}\text{CH}_2\text{C}(\text{CH}_3)_2\text{OH}^+ \rightarrow$ $\text{Cu}^{2+} + \text{OH}^- + \text{CH}_2=\text{C}(\text{CH}_3)_2$	$(2.6 \pm 0.9) \times 10^{10}$	4.5	p.r.	Est. from p.b.k. at 400 nm in N <sub>2</sub> O-satd. soln. contg. <i>tert</i> -BuOH and Cu <sup>2+</sup> .	78A322
57.075	$\cdot\text{CH}_2\text{OH} + \text{Cu}^+ \rightleftharpoons \text{Cu}^{\text{II}}\text{CH}_2\text{OH}^+$	~10 <sup>10</sup>	4.5	p.r.	Est. from growth and decay of absorption in soln. contg. MeOH and Cu <sup>2+</sup> ; $K \approx 10^4$ dm <sup>3</sup> mol <sup>-1</sup> .	78A322
		~6 x 10 <sup>9</sup>	4.0	p.r.	Est. from growth and decay of absorption in soln. contg. MeOH and Cu <sup>2+</sup> ; $K \approx 5 \times 10^3$ dm <sup>3</sup> mol <sup>-1</sup> .	80A278
57.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{Cu}^+$	~5 x 10 <sup>9</sup>	4.5	p.r.	Est. from growth and decay of absorption in soln. contg. 2-PrOH and Cu <sup>2+</sup> .	78A322
58.	<b>Copper(I) ion, complex with ethylene</b>					
58.014	$\cdot\text{CH}_2\text{CH}_2\text{OH} + \text{CuC}_2\text{H}_4^+ \rightarrow$ $2\text{C}_2\text{H}_4 + \text{Cu}^{2+} + \text{OH}^-$	$(7.8 \pm 2.5) \times 10^7$	4.5	p.r.	Est. from effect of [C <sub>2</sub> H <sub>4</sub> ] on rate of formn. and decay of CuC <sub>2</sub> H <sub>4</sub> <sup>+</sup> at 227 nm; radical from OH + ethylene.	78A322
58.016	$\cdot\text{CH}_2\text{C}(\text{CH}_3)_2\text{OH} + \text{CuC}_2\text{H}_4^+ \rightarrow$ $\text{C}_2\text{H}_4 + \text{CH}_2=\text{C}(\text{CH}_3)_2 + \text{Cu}^{2+}$ $+ \text{OH}^-$	$(5.3 \pm 1.6) \times 10^7$	4.5	p.r.	Est. from effect of [C <sub>2</sub> H <sub>4</sub> ] on rate of formn. and decay of CuC <sub>2</sub> H <sub>4</sub> <sup>+</sup> at 227 nm in soln. contg. <i>tert</i> -BuOH.	78A322
58a.	<b>Ethylenediaminetetraacetatocuprate(I) ion</b>					
58a.079	$\text{CH}_3\text{CH}_2\text{CH}_2\dot{\text{C}}\text{HOH} + \text{CuEDTA}^{3-} \rightarrow$ $\text{RCuEDTA}^{3-}$	(4 to 5) x 10 <sup>9</sup>	7.5	p.r.	P.b.k. at 440 nm in soln. contg. 0.01 mol L <sup>-1</sup> CuEDTA <sup>2-</sup> and 0.06 mol L <sup>-1</sup> 1-BuOH assuming 2 <i>k</i> (R + R) = 10 <sup>9</sup> .	80A153
59.	<b>Copper(II) ions</b>					
59.001	$\cdot\text{CH}_3 + \text{Cu}_{\text{aq}}^{2+} \rightarrow \text{CH}_3\text{Cu}^{2+}$	$(7.4 \pm 0.6) \times 10^9$	~2	f.p.	P.b.k. in 10 <sup>-2</sup> mol L <sup>-1</sup> HClO <sub>4</sub> soln. contg. 0.01-0.2 mol L <sup>-1</sup> Cu <sup>2+</sup> and Co(NH <sub>3</sub> ) <sub>5</sub> O <sub>2</sub> CCH <sub>3</sub> <sup>2+</sup> .	78F301
59.014	$\cdot\text{CH}_2\text{CH}_2\text{OH} + \text{Cu}_{\text{aq}}^{2+} \rightarrow$ $\text{Cu}^{\text{III}}-\text{CH}_2\text{CH}_2\text{OH}^+ \rightarrow$ $\text{Cu}^+ + \text{prod.}$	$(1.9 \pm 0.4) \times 10^7$ $(2.2 \pm 0.4) \times 10^7$	4.5 2	p.r.	P.b.k. at 270 nm (Cu <sup>I</sup> C <sub>2</sub> H <sub>4</sub> ) in N <sub>2</sub> O-contg. ethylene (10 <sup>-3</sup> mol L <sup>-1</sup> ) soln.; ·C <sub>2</sub> H <sub>5</sub> is present at pH 4.5 (~10%) and pH 2 (~50%).	78A322
		$(3 \pm 1) \times 10^7$	6	p.r.	P.b.k. in soln. contg. (1-5) x 10 <sup>-4</sup> mol L <sup>-1</sup> CuSO <sub>4</sub> satd. with ethylene-N <sub>2</sub> O (1:1).	80A277
59.016	$\cdot\text{CH}_2\text{C}(\text{CH}_3)_2\text{OH} + \text{Cu}_{\text{aq}}^{2+} \rightarrow \text{Cu}^{\text{III}}-\text{R}$ $\rightarrow \text{Cu}^+ + \text{prod.}$	$(2.7 \pm 0.5) \times 10^6$ $(3.2 \pm 0.6) \times 10^6$	4.5 3	p.r.	P.b.k. at 320 nm (Cu <sup>I</sup> CH <sub>2</sub> CHCONH <sub>2</sub> ) in N <sub>2</sub> O-satd. soln. contg. <i>tert</i> -BuOH and acrylamide.	78A322
		$(5 \pm 2) \times 10^6$	6	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. (1-5) x 10 <sup>-4</sup> mol L <sup>-1</sup> CuSO <sub>4</sub> and 0.1 mol L <sup>-1</sup> <i>tert</i> -BuOH.	80A277

TABLE 1. Rate constants for reactions of aliphatic radicals with inorganic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
59.035	$\cdot\text{CH}_2\text{CO}_2^- + \text{Cu}^{2+} \rightarrow \text{Cu}^{\text{III}}\text{CH}_2\text{CO}_2^+$ $\rightarrow \text{Cu}^+ + \text{prod.}$	$(6.4 \pm 1.5) \times 10^9$	6.0	p.r.	D.k. in N <sub>2</sub> O-satd. 10 <sup>-2</sup> mol L <sup>-1</sup> acetate soln.	77A025
59.037	$\text{CH}_3\dot{\text{C}}\text{HCO}_2^- + \text{Cu}_{\text{aq}}^{2+} \rightarrow \text{Cu}^{\text{III}}\text{-R}$ $\rightarrow \text{Cu}^+ + \text{prod.}$	$(5 \pm 0.5) \times 10^8$	6	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. (2-10) x 10 <sup>-5</sup> mol L <sup>-1</sup> CuSO <sub>4</sub> and 10 <sup>-2</sup> mol L <sup>-1</sup> propionate.	80A277
59.041	$\cdot\text{O}_2\text{CCHOH}\dot{\text{C}}\text{HCO}_2^- + \text{Cu}_{\text{aq}}^{2+} \rightarrow$ $\text{Cu}^{\text{III}}\text{-R} \rightarrow \text{Cu}^+ + \text{prod.}$	$(8 \pm 0.3) \times 10^8$	6	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. (5-10) x 10 <sup>-5</sup> mol L <sup>-1</sup> CuSO <sub>4</sub> and (2.5-10) x 10 <sup>-4</sup> mol L <sup>-1</sup> fumarate; pH dependent, $k = 8.0 \times 10^8$ , $1.8 \times 10^8$ , $1.2 \times 10^8$ , $6.4 \times 10^7$ , $3.1 \times 10^7$ , and $< 2 \times 10^7$ at pH 5.0, 3.5, 3.0, 2.6, 2.1, and 1.5, resp.	80A277
59.048	$\cdot\text{CCl}_3$ (+ $\cdot\text{CHCl}_2$ ) + $\text{Cu}_{\text{aq}}^{2+} \rightarrow$ $\text{Cu}^{\text{III}}\text{-CCl}_3 \rightarrow \text{Cu}^+ + \text{prod.}$	$(3 \pm 1.5) \times 10^7$	6	p.r.	P.b.k. in Ar-satd. soln. contg. (2-10) x 10 <sup>-5</sup> mol L <sup>-1</sup> CuSO <sub>4</sub> and (1-10) x 10 <sup>-2</sup> mol L <sup>-1</sup> CHCl <sub>3</sub> ; $G(\cdot\text{CHCl}_2) = G(e_{\text{aq}}^-)$ and $G(\cdot\text{CCl}_3) = G(\text{OH})$ .	80A277
59.075	$\cdot\text{CH}_2\text{OH} + \text{Cu}_{\text{aq}}^{2+} \rightarrow \text{Cu}^+ +$ $\text{CH}_2\text{O} + \text{H}^+$	$(1.1 \pm 0.2) \times 10^8$	5-6	p.r.	D.k. in N <sub>2</sub> O-satd. 10 <sup>-2</sup> mol L <sup>-1</sup> MeOH soln.	72A018
		$(1.6 \pm 0.3) \times 10^8$	2-5	p.r.	P.b.k. at 320 nm (Cu <sup>I</sup> CH <sub>2</sub> CHCONH <sub>2</sub> ) in soln. contg. MeOH and acrylamide (10 <sup>-2</sup> mol L <sup>-1</sup> ).	78A322
		$(1.9 \pm 0.4) \times 10^8$	$\leq 3$	p.r.	D.k.	78A322
		$(1.6 \pm 0.2) \times 10^8$	6	p.r.	D.k. at ~300 nm (radical) in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> MeOH.	80A277
59.076	$\text{CH}_3\dot{\text{C}}\text{HOH} + \text{Cu}_{\text{aq}}^{2+} \rightarrow \text{Cu}^+ +$ $\text{CH}_3\text{CHO} + \text{H}^+$	$(7.4 \pm 1.1) \times 10^7$	5-6	p.r.	D.k. in N <sub>2</sub> O-satd. 10 <sup>-2</sup> mol L <sup>-1</sup> EtOH soln.	72A018
		$(9.4 \pm 1.9) \times 10^7$	2-5	p.r.	P.b.k. at 320 nm (Cu <sup>I</sup> CH <sub>2</sub> CHCONH <sub>2</sub> ) in soln. contg. EtOH and acrylamide (10 <sup>-2</sup> mol L <sup>-1</sup> ).	78A322
		$(9 \pm 2) \times 10^7$	6	p.r.	D.k. at ~300 nm (radical) in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> EtOH.	80A277
59.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{Cu}_{\text{aq}}^{2+} \rightarrow \text{Cu}^+ +$	$(4.5 \pm 0.7) \times 10^7$	5-6	p.r.	D.k. in N <sub>2</sub> O-satd. 10 <sup>-2</sup> mol L <sup>-1</sup> 2-PrOH soln.	72A018
		$(5.2 \pm 1.0) \times 10^7$	2-5	p.r.	P.b.k. at 320 nm (Cu <sup>I</sup> CH <sub>2</sub> CHCONH <sub>2</sub> ) in soln. contg. 2-PrOH and acrylamide (10 <sup>-2</sup> mol L <sup>-1</sup> ).	78A322
		$(5.0 \pm 1.0) \times 10^7$	$\leq 3$	p.r.	D.k.	78A322
		$(5.0 \pm 1.5) \times 10^7$	6	p.r.	D.k. at ~300 nm (radical) in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> 2-PrOH.	80A277
59.113	$\cdot\text{A}^- + \text{Cu}_{\text{aq}}^{2+}$ (A <sup>-</sup> = Radical from ascorbate)	$\leq 10^6$		phot.	Est.	78A394
59.147	$\cdot\text{CO}_2^- + \text{Cu}_{\text{aq}}^{2+} \rightarrow \text{CO}_2 + \text{Cu}^+$	$(1.5 \pm 0.3) \times 10^8$	6.8	p.r.	D.k. at 260 nm in N <sub>2</sub> O-satd. formate (0.1 mol L <sup>-1</sup> ) soln.	78A176
60.	<b>(5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-diene)copper(II) ion</b>					
60.075	$\cdot\text{CH}_2\text{OH} + \text{Cu}^{\text{II}}\text{L} \rightarrow \text{Cu}^{\text{I}}\text{L}$	$\leq 2 \times 10^6$	3.5-10	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> MeOH; product ident. with that from e <sub>aq</sub> <sup>-</sup> .	80A189
	$\cdot\text{CH}_2\text{O}^- + \text{Cu}^{\text{II}}\text{L} \rightarrow \text{Cu}^{\text{I}}\text{L}$	$9.0 \times 10^8$	12.0	p.r.	P.b.k. at 410 nm; no reduction obs. in neutral soln.; in methanolic soln. $k = 2.2 \times 10^4$ was detd. by f.phot. (p.b.k. at 415 nm)[77F639].	76A039
60.076	$\text{CH}_3\dot{\text{C}}\text{HOH} + \text{Cu}^{\text{II}}\text{L} \rightarrow \text{Cu}^{\text{I}}\text{L}$	$\leq 2 \times 10^6$	3.5-10	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> EtOH; product ident. with that from e <sub>aq</sub> <sup>-</sup> .	80A189
60.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{Cu}^{\text{II}}\text{L} \rightarrow \text{Cu}^{\text{I}}\text{L}$	$\leq 2 \times 10^6$	3.5-10	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> 2-PrOH; product ident. with that from e <sub>aq</sub> <sup>-</sup> .	80A189
	$(\text{CH}_3)_2\dot{\text{C}}\text{O}^- + \text{Cu}^{\text{II}}\text{L} \rightarrow \text{Cu}^{\text{I}}\text{L}$	$9.0 \times 10^8$	12.5	p.r.	P.b.k. at 410 nm; no redn. obs. in neutral soln.	76A039

TABLE I. Rate constants for reactions of aliphatic radicals with inorganic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
60.147	$\cdot\text{CO}_2^- + \text{Cu}^{\text{II}}\text{L} \rightarrow \text{Cu}^{\text{I}}\text{L}$	$2.3 \times 10^9$	7.0	p.r.	P.b.k. at 410 nm.	76A039
61.	<b>Glycylglycylglycinatocopper(II) complex</b>					
61.147	$\cdot\text{CO}_2^- + \text{Cu}^{\text{II}}(\text{gly})_3 \rightarrow \text{Cu}(\text{I}) + \text{CO}_2$	$(2.8 \pm 0.3) \times 10^8$	9.1	p.r.	D.k. at 550 nm (Cu <sup>II</sup> ) in N <sub>2</sub> O-satd. formate (10 <sup>-2</sup> mol L <sup>-1</sup> ) soln. contg. Cu(II) and gly <sub>3</sub> in 1:5, 1:3 and 1:2 ratio.	76A016
62.	<b>(Oxidized glutathione)copper(II) complex</b>					
62.147	$\cdot\text{CO}_2^- + \text{Cu}^{\text{II}}(\text{GSSG})_n \rightarrow \text{Cu}(\text{I}) + \text{CO}_2$	$(1.0 \pm 0.2) \times 10^8$	11	p.r.	D.k. at 595 nm (Cu <sup>II</sup> ) in N <sub>2</sub> O-satd. soln. contg. formate ion; 10% of the $\cdot\text{CO}_2^-$ reacted with the disulfide $\rightarrow$ GSSG <sup>-</sup> (p.b.k. at 410 nm).	76A016
63.	<b>Histidinecopper(II) complex</b>					
63.147	$\cdot\text{CO}_2^- + \text{Cu}(\text{II}) \rightarrow \text{Cu}(\text{I})$	$(4.1 \pm 0.4) \times 10^8$	11.0	p.r.	D.k. at 600 nm (Cu <sup>II</sup> ) in N <sub>2</sub> O-satd. soln. contg. formate.	77A138
64.	<b>Glycylhistidinecopper(II) complex</b>					
64.147	$\cdot\text{CO}_2^- + \text{Cu}(\text{II})$	$(4.5 \pm 0.3) \times 10^8$ $(1.6 \pm 0.2) \times 10^7$	6.6 11.0	p.r.	D.k. at 565 nm (Cu <sup>II</sup> ) in N <sub>2</sub> O-satd. soln. contg. formate.	77A138
65.	<b><math>\beta</math>-Alanylhistidinecopper(II) complex</b>					
65.147	$\cdot\text{CO}_2^- + \text{Cu}(\text{II})$	$(3.5 \pm 0.4) \times 10^8$	7.5–11	p.r.	D.k. at 600 nm (Cu <sup>II</sup> ) in N <sub>2</sub> O-satd. soln. contg. formate.	77A138
65a.	<b>Ethylenediaminetetraacetatocuprate(II) ion</b>					
65a.079	$\text{CH}_3\text{CH}_2\text{CH}_2\dot{\text{C}}\text{HOH} + \text{CuEDTA}^{2-}$	$(0.5 \text{ to } 1) \times 10^6$	7.5	p.r.	Calcd. from concn. effect on p.b.k. for $\text{RCuEDTA}^{2-}$ ; see 58a.079.	80A153
	<b>Eu</b>					
66.	<b>Europium(III) ion</b>					
66.147	$\cdot\text{CO}_2\text{H}(\cdot\text{CO}_2^-) + \text{Eu}(\text{III}) \rightarrow \text{Eu}(\text{II})$	$> 7 \times 10^6$	1.4	p.r.	Est. from p.b.k. at 250 nm (Eu <sup>III</sup> ).	73A057
	<b>Fe</b>					
67.	<b>Iron(II) ion</b>					
67.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{Fe}(\text{H}_2\text{O})_6^{2+}$	$2.9 \times 10^6$	$\sim 2$	p.r.	Est. from change in abs. at 250 nm; product suggested to be $\text{Fe}(\text{H}_2\text{O})_5\text{R}^{2+}$ .	75A166
	<i>Deuteroheme See 223.</i>					
68.	<b>Iron(III) ions</b>					
68.075	$\cdot\text{CH}_2\text{OH} + \text{Fe}^{3+} \rightarrow \text{Fe}^{2+} + \text{CH}_2\text{O} + \text{H}^+$	$1 \times 10^6$ (rel.) $(8 \pm 2) \times 10^7$	$\sim 1$	$\gamma$ -r.	C.k. rel. to $k(\text{R} + \text{C}(\text{NO}_2)_4) = 5 \times 10^9$ ; obs. $\text{C}(\text{NO}_2)_3^-$ and $\text{Fe}^{2+}$ yields. Unpubl. data, C.N.Barnes and G.V.Buxton.	77G411 78A322
68.076	$\text{CH}_3\dot{\text{C}}\text{HOH} + \text{Fe}^{3+} \rightarrow \text{Fe}^{2+} + \text{H}^+ + \text{CH}_3\text{CHO}$	$2.7 \times 10^8$ (rel.) $(3.8 \pm 0.2) \times 10^8$	$\sim 1$	$\gamma$ -r.	C.k. rel. to $k(\text{R} + \text{C}(\text{NO}_2)_4) = 5 \times 10^9$ ; obs. $\text{C}(\text{NO}_2)_3^-$ and $\text{Fe}^{2+}$ yields. Unpubl. data, C.N.Barnes and G.V.Buxton.	77G411 78A322
68.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{Fe}^{3+} \rightarrow \text{Fe}^{2+} + \text{H}^+ + (\text{CH}_3)_2\text{CO}$	$(4.5 \pm 0.4) \times 10^8$ $1.8 \times 10^8$ (rel.) $(5.8 \pm 0.3) \times 10^8$	$\sim 1$ $\sim 1$	p.r. $\gamma$ -r.	D.k. at 270 nm in soln. contg. 1 mol L <sup>-1</sup> 2-PrOH, $2 \times 10^{-4}$ mol L <sup>-1</sup> $\text{Fe}(\text{ClO}_4)_3$ and 0.5 mol L <sup>-1</sup> $\text{HClO}_4$ ; $\mu = 1$ mol L <sup>-1</sup> . C.k. rel. to $k(\text{R} + \text{C}(\text{NO}_2)_4) = 5 \times 10^9$ ; obs. $\text{C}(\text{NO}_2)_3^-$ and $\text{Fe}^{2+}$ yields. Unpubl. data, C.N.Barnes and G.V.Buxton.	74A074 77G411 78A322

TABLE 1. Rate constants for reactions of aliphatic radicals with inorganic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
69.	<b>Ferricyanide ion</b>					
69.001	$\cdot\text{CH}_3 + \text{Fe}(\text{CN})_6^{3-}$	$(5 \pm 1) \times 10^6$	6-7	p.r.	D.k. at 420 nm in N <sub>2</sub> O-satd. soln. contg. dimethyl sulfoxide.	81A003
69.002	$\cdot\text{CH}_2\text{CH}_3 + \text{Fe}(\text{CN})_6^{3-}$	$(5.0 \pm 0.5) \times 10^7$	6-7	p.r.	D.k. at 420 nm in N <sub>2</sub> O-satd. soln. contg. diethyl sulfoxide.	81A003
69.002a	$(\text{CH}_3)_2\dot{\text{C}}\text{H} + \text{Fe}(\text{CN})_6^{3-}$	$(1.25 \pm 0.5) \times 10^9$	6-7	p.r.	D.k. at 420 nm in N <sub>2</sub> O-satd. soln. contg. di-(1-methylethyl) sulfoxide.	81A003
69.002b	$(\text{CH}_3)_3\dot{\text{C}} + \text{Fe}(\text{CN})_6^{3-}$	$(3.6 \pm 1.5) \times 10^9$	6-7	p.r.	D.k. at 420 nm in N <sub>2</sub> O-satd. soln. contg. di-( <i>tert</i> -butyl) sulfoxide.	81A003
69.014	$\cdot\text{CH}_2\text{CH}_2\text{OH} + \text{Fe}(\text{CN})_6^{3-}$	$\sim 10^7$	7	p.r.	D.k. in soln. of 10 <sup>-2</sup> mol L <sup>-1</sup> ethylene contg. 10 <sup>-2</sup> mol L <sup>-1</sup> N <sub>2</sub> O.	69G522
69.035	$\cdot\text{CH}_2\text{CO}_2\text{H} + \text{Fe}(\text{CN})_6^{3-}$	$2 \times 10^6$	3.3	p.r.	D.k. at 420 nm in N <sub>2</sub> O-satd. soln. contg. acetic acid.	81A003
69.043	$\cdot\text{CH}_2\text{Cl} + \text{Fe}(\text{CN})_6^{3-}$	$< 5 \times 10^5$	6-7	p.r.	D.k. at 420 nm in N <sub>2</sub> O-satd. soln. contg. methylene chloride.	81A003
69.045	$\cdot\text{CHCl}_2 + \text{Fe}(\text{CN})_6^{3-}$	$< 5 \times 10^5$	6-7	p.r.	D.k. at 420 nm in N <sub>2</sub> O-satd. soln. contg. chloroform.	81A003
69.056	$\text{NH}_2\dot{\text{C}}\text{HCO}_2^- + \text{Fe}(\text{CN})_6^{3-}$	$1 \times 10^9$		p.r.	D.k. at 420 nm in soln. contg. glycine.	76A082
69.075	$\cdot\text{CH}_2\text{OH} + \text{Fe}(\text{CN})_6^{3-} \rightarrow$ $\text{CH}_2\text{O} + \text{H}^+ + \text{Fe}(\text{CN})_6^{4-}$	$4.0 \times 10^9$	7	p.r.	D.k. at 410 nm (ferricyanide) in soln. contg. MeOH.	68G308 69G522
		$(4.2 \pm 0.4) \times 10^9$	$\sim 6$	p.r.	Condy. change in N <sub>2</sub> O-satd. soln. contg. MeOH.	70C254
	$\cdot\text{CH}_2\text{O}^- + \text{Fe}(\text{CN})_6^{3-} \rightarrow$ $\text{CH}_2\text{O} + \text{Fe}(\text{CN})_6^{4-}$	$3.1 \times 10^9$	13	p.r.	D.k. at 410 nm (ferricyanide) in soln. contg. MeOH.	68G308
69.076	$\text{CH}_3\dot{\text{C}}\text{HOH} + \text{Fe}(\text{CN})_6^{3-}$	$5.3 \times 10^9$	7	p.r.	D.k. at 410 nm in 0.1 mol L <sup>-1</sup> EtOH soln.	69G522
		$4 \times 10^9$		p.r.	D.k. at 420 nm in N <sub>2</sub> O-satd. soln. contg. EtOH.	79N061
69.077	$\text{CH}_3\text{CH}_2\dot{\text{C}}\text{HOH} + \text{Fe}(\text{CN})_6^{3-}$	$3.7 \times 10^9$	7	p.r.	D.k. at 410 nm in 0.1 mol L <sup>-1</sup> 1-PrOH soln.	69G522
69.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{Fe}(\text{CN})_6^{3-}$	$4.7 \times 10^9$	7	p.r.	D.k. at 410 nm in 0.1 mol L <sup>-1</sup> 2-PrOH soln.	69G522
		$(5.6 \pm 0.6) \times 10^9$	7.0	p.r.	D.k. at 420 nm.	73A104
69.080	$\text{CH}_3\dot{\text{C}}\text{OHCH}_2\text{CH}_3 + \text{Fe}(\text{CN})_6^{3-}$	$4.8 \times 10^9$	7	p.r.	D.k. at 410 nm in 0.1 mol L <sup>-1</sup> 2-BuOH soln.	69G522
69.081	$(\text{CH}_3)_2\text{CH}\dot{\text{C}}\text{HOH} + \text{Fe}(\text{CN})_6^{3-}$	$3.0 \times 10^9$	7	p.r.	D.k. at 410 nm in 0.3 mol L <sup>-1</sup> 2-methyl-1-propanol soln.	69G522
69.082	$\text{CH}_3(\text{CH}_2)_3\dot{\text{C}}\text{HOH} + \text{Fe}(\text{CN})_6^{3-}$	$(9 \pm 2) \times 10^8$		p.r.	D.k. at 420 nm in N <sub>2</sub> O-satd. soln. contg. 1-pentanol.	79N061
69.084	$\cdot\text{CH}_2\dot{\text{C}}\text{OH}(\text{CH}_2)_2^- + \text{Fe}(\text{CN})_6^{3-} \rightarrow$ $\text{R}=\text{O} + \text{Fe}(\text{CN})_6^{4-} + \text{H}^+$	$2.6 \times 10^9$	7	p.r.	D.k. at 410 nm in soln. contg. 10 <sup>-3</sup> mol L <sup>-1</sup> cyclobutanone and 0.1 mol L <sup>-1</sup> <i>tert</i> -BuOH at 2°C; $k = 5.3 \times 10^9$ at 64°C;	76A103
					$E_a = 2.1$ kcal mol <sup>-1</sup> (8.8 kJ mol <sup>-1</sup> ).	
69.085	$\cdot\text{CH}_2\dot{\text{C}}\text{OH}(\text{CH}_2)_3^- + \text{Fe}(\text{CN})_6^{3-} \rightarrow$ $\text{R}=\text{O} + \text{Fe}(\text{CN})_6^{4-} + \text{H}^+$	$2.3 \times 10^9$	7	p.r.	D.k. at 410 nm in soln. contg. 10 <sup>-3</sup> mol L <sup>-1</sup> cyclopentanone and 0.1 mol L <sup>-1</sup> <i>tert</i> -BuOH at 2°C; $k = 5.4 \times 10^9$ at 64°C; $E_a = 2.6$ kcal mol <sup>-1</sup> (10.9 kJ mol <sup>-1</sup> ).	76A103
69.086	$\cdot\text{CH}_2\dot{\text{C}}\text{OH}(\text{CH}_2)_4^- + \text{Fe}(\text{CN})_6^{3-} \rightarrow$ $\text{R}=\text{O} + \text{Fe}(\text{CN})_6^{4-} + \text{H}^+$	$1.8 \times 10^9$	7	p.r.	D.k. at 410 nm in soln. contg. 10 <sup>-3</sup> mol L <sup>-1</sup> cyclohexanone and 0.1 mol L <sup>-1</sup> <i>tert</i> -BuOH at 2°C; $k = 5.0 \times 10^9$ at 64°C; $E_a = 2.9$ kcal mol <sup>-1</sup> (12.1 kJ mol <sup>-1</sup> ).	76A103
		$(1.0 \pm 0.2) \times 10^9$		p.r.	D.k. at 420 nm in N <sub>2</sub> O-satd. soln. contg. cyclohexanol.	79N061
69.087	$\cdot\text{CH}_2\dot{\text{C}}\text{OH}(\text{CH}_2)_5^- + \text{Fe}(\text{CN})_6^{3-} \rightarrow$ $\text{R}=\text{O} + \text{Fe}(\text{CN})_6^{4-} + \text{H}^+$	$2.1 \times 10^9$	7	p.r.	D.k. at 410 nm in soln. contg. 10 <sup>-3</sup> mol L <sup>-1</sup> cycloheptanone and 0.1 mol L <sup>-1</sup> <i>tert</i> -BuOH at 2°C; $k = 5.4 \times 10^9$ at 64°C; $E_a = 2.8$ kcal mol <sup>-1</sup> (11.7 kJ mol <sup>-1</sup> ).	76A103
69.088	$\cdot\text{CH}_2\dot{\text{C}}\text{OH}(\text{CH}_2)_6^- + \text{Fe}(\text{CN})_6^{3-} \rightarrow$ $\text{R}=\text{O} + \text{Fe}(\text{CN})_6^{4-} + \text{H}^+$	$2.2 \times 10^9$	7	p.r.	D.k. at 410 nm in soln. contg. 10 <sup>-3</sup> mol L <sup>-1</sup> cyclooctanone and 0.1 mol L <sup>-1</sup> <i>tert</i> -BuOH at 2°C; $k = 5.4 \times 10^9$ at 64°C; $E_a = 2.8$ kcal mol <sup>-1</sup> (11.7 kJ mol <sup>-1</sup> ).	76A103



TABLE 1. Rate constants for reactions of aliphatic radicals with inorganic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
69.091	$\text{CH}_3\dot{\text{C}}\text{HOSO}_3^- + \text{Fe}(\text{CN})_6^{3-}$	$\approx 2 \times 10^8$		p.r.	D.k. at 420 nm in N <sub>2</sub> O-satd. soln. contg. ethylsulfate ion; values are given also for radicals produced from reaction of OH with higher alkyl sulfates.	79N061
69.092a	$\cdot\text{CH}_2\text{OCH}_3 + \text{Fe}(\text{CN})_6^{3-}$	$(4.3 \pm 0.23) \times 10^9$	6-7	p.r.	D.k. at 420 nm in N <sub>2</sub> O-satd. soln. contg. dimethyl ether.	81A003
69.097	$\text{CH}_3(\dot{\text{C}}\text{O}^-)\text{CH}_2\text{CO}_2^- + \text{Fe}(\text{CN})_6^{3-}$	$(7.3 \pm 0.7) \times 10^8$	7.0	p.r.	D.k. at 420 nm in soln. contg. acetoacetate ion (radical by reaction with $e_{\text{aq}}^-$ ).	73A104
69.100	$\cdot\text{CHOHCH}(\text{NH}_2)\text{CO}_2^- + \text{Fe}(\text{CN})_6^{3-}$	$3.2 \times 10^9$	7	p.r.	D.k. at 410 nm in soln. contg. 0.3 mol L <sup>-1</sup> serine.	69G522
69.101	$\cdot\text{CHOHCH}_2\text{OH} + \text{Fe}(\text{CN})_6^{3-}$	$3.6 \times 10^9$	7	p.r.	D.k. at 410 nm in soln. contg. 0.3 mol L <sup>-1</sup> ethylene glycol.	69G522
69.105	R + Fe(CN) <sub>6</sub> <sup>3-</sup> (R = Radicals from polyethylene oxide)	$2.1 \times 10^9$	7	p.r.	D.k. at 410 nm in soln. contg. ~2% polyethylene oxide.	69G522
69.106	$\cdot\text{CHOHCHOHCH}_2\text{OH} + \text{Fe}(\text{CN})_6^{3-}$ (+ CH <sub>2</sub> COHCH <sub>2</sub> OH)	$3.3 \times 10^9$	7	p.r.	D.k. at 410 nm in soln. contg. 0.3 mol L <sup>-1</sup> glycerol.	69G522
69.108	R + Fe(CN) <sub>6</sub> <sup>3-</sup> (R = Radicals from deoxyribose)	$2.8 \times 10^9$	7	p.r.	D.k. at 410 nm in soln. contg. 0.3 mol L <sup>-1</sup> deoxyribose	71G618
69.111	R + Fe(CN) <sub>6</sub> <sup>3-</sup> (R = Radicals from glucose)	$1.4 \times 10^9$ $1.9 \times 10^9$	7	p.r. p.r.	Soln. contains 2-deoxy-D-ribose. D.k. at 410 nm in soln. contg. 0.3 mol L <sup>-1</sup> glucose.	78A175 69G522
69.115	$\cdot\text{CHOHCO}_2^- + \text{Fe}(\text{CN})_6^{3-}$	$5 \times 10^8$	7	p.r.	D.k. at 410 nm in soln. contg. 0.3 mol L <sup>-1</sup> glycolate ion.	69G522
69.117	$\cdot\text{CHOHCO}_2\text{H} + \text{Fe}(\text{CN})_6^{3-}$	$1.0 \times 10^8$	3.4	p.r.	D.k. at 420 nm in N <sub>2</sub> O-satd. soln. contg. glycolate.	81A003
	$\cdot\text{CH}(\text{O})\text{CO}_2^- + \text{Fe}(\text{CN})_6^{3-}$	$7.5 \times 10^8$	11.5			
	$\text{CH}_3\dot{\text{C}}\text{OHCO}_2^- + \text{Fe}(\text{CN})_6^{3-}$	$1.5 \times 10^9$	7	p.r.	D.k. at 410 nm in soln. contg. 0.3 mol L <sup>-1</sup> lactate ion.	69G522
69.147	$\cdot\text{CO}_2^- + \text{Fe}(\text{CN})_6^{3-} \rightarrow$ $\text{CO}_2 + \text{Fe}(\text{CN})_6^{4-}$	$1.06 \times 10^9$	7	p.r.	D.k. at 410 nm in soln. contg. 0.3 mol L <sup>-1</sup> formate ion.	69G522
70.	<b>Pentacyanonitrosylferrate(III) ion</b>					
70.075	$\cdot\text{CH}_2\text{OH} + \text{Fe}(\text{CN})_5\dot{\text{N}}\text{O}^{2-} \rightarrow$ $\text{CH}_2\text{O} + \text{H}^+ + \text{Fe}(\text{CN})_5\dot{\text{N}}\text{O}^{2-}$	$6.7 \times 10^8$	8.5	p.r.	P.b.k. in N <sub>2</sub> O-satd. 0.5 mol L <sup>-1</sup> MeOH soln.	77A120
70.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{Fe}(\text{CN})_5\dot{\text{N}}\text{O}^{2-}$	$2.9 \times 10^9$	7.0	p.r.	P.b.k. in N <sub>2</sub> O-satd. 0.5 mol L <sup>-1</sup> 2-PrOH soln.	77A120
70.147	$\cdot\text{CO}_2^- + \text{Fe}(\text{CN})_5\dot{\text{N}}\text{O}^{2-} \rightarrow$ $\text{CO}_2 + \text{Fe}(\text{CN})_5\dot{\text{N}}\text{O}^{3-}$	$3.7 \times 10^8$	7	p.r.	P.b.k. at 450 nm in N <sub>2</sub> O-satd. $2 \times 10^{-2}$ mol L <sup>-1</sup> formate soln.; $I = 0.02$ .	69G052
		$4.0 \times 10^8$	7.0	p.r.	P.b.k. in N <sub>2</sub> O-satd. 0.1 mol L <sup>-1</sup> formate soln.	77A120
71.	<b>Pentacyanonitrosylferrate(III) radical ion (electron adduct)</b>					
71.006	$\cdot\text{CH}_2\text{C}(\text{CH}_3)_2\text{CO}_2^- + \text{Fe}(\text{CN})_5\dot{\text{N}}\text{O}^{3-} \rightarrow$ $\text{Fe}(\text{CN})_5\text{N}(\text{O})\text{CH}_2\text{C}(\text{CH}_3)_2\text{CO}_2^{4-}$	$(2.0 \pm 0.3) \times 10^9$	6.0- 7.5	p.r.	D.k. at 380 nm (nitrosyl radical, $\epsilon = 3.5 \times 10^3$ L mol <sup>-1</sup> cm <sup>-1</sup> ), as well as p.b.k. in soln. contg. 0.3 mol L <sup>-1</sup> pivalate ion and $5 \times 10^{-4}$ mol L <sup>-1</sup> Fe(CN) <sub>5</sub> NO <sup>2-</sup> .	79A134
71.012	$\cdot\text{CH}_2\text{C}(\text{CH}_3)_2\text{NH}_3^+ + \text{Fe}(\text{CN})_5\dot{\text{N}}\text{O}^{3-} \rightarrow$ $\text{Fe}(\text{CN})_5\text{N}(\text{O})\text{CH}_2\text{C}(\text{CH}_3)_2\text{NH}_3^{2-}$	$(1.2 \pm 0.2) \times 10^{10}$	6.0- 7.5	p.r.	D.k. at 380 nm (nitrosyl radical, $\epsilon = 3.5 \times 10^3$ L mol <sup>-1</sup> cm <sup>-1</sup> ), as well as p.b.k. in soln. contg. 0.3 mol L <sup>-1</sup> <i>tert</i> -butylamine and $5 \times 10^{-4}$ mol L <sup>-1</sup> Fe(CN) <sub>5</sub> NO <sup>2-</sup> .	79A134
71.013	$\cdot\text{CH}_2\text{C}(\text{CH}_3)(\text{NH}_3^+)\text{CO}_2^- +$ $\text{Fe}(\text{CN})_5\dot{\text{N}}\text{O}^{3-} \rightarrow$ $\text{Fe}(\text{CN})_5\text{N}(\text{O})\text{CH}_2\text{C}(\text{CH}_3)(\text{NH}_3)\text{CO}_2^{3-}$	$(1.6 \pm 0.2) \times 10^9$	6.0- 7.5	p.r.	D.k. at 380 nm (nitrosyl radical, $\epsilon = 3.5 \times 10^3$ L mol <sup>-1</sup> cm <sup>-1</sup> ), as well as p.b.k. in soln. contg. 0.3 mol L <sup>-1</sup> 2-aminoisobutyrate ion and $5 \times 10^{-4}$ mol L <sup>-1</sup> Fe(CN) <sub>5</sub> NO <sup>2-</sup> .	79A134

TABLE 1. Rate constants for reactions of aliphatic radicals with inorganic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
71.016	$\cdot\text{CH}_2\text{C}(\text{CH}_3)_2\text{OH} + \text{Fe}(\text{CN})_5\text{NO}^{3-} \rightarrow \text{Fe}(\text{CN})_5\text{N}(\text{O})\text{CH}_2\text{C}(\text{CH}_3)_2\text{OH}^{\cdot}$	$(2.5 \pm 0.4) \times 10^9$	6.0–7.5	p.r.	D.k. at 380 nm (nitrosyl radical, $\epsilon = 3.5 \times 10^3$ L mol <sup>-1</sup> cm <sup>-1</sup> ), as well as p.b.k. in soln. contg. 0.3 mol L <sup>-1</sup> <i>tert</i> -BuOH and 5 x 10 <sup>-4</sup> mol L <sup>-1</sup> Fe(CN) <sub>5</sub> NO <sup>2-</sup> .	79A134
71.017	$\cdot\text{CH}_2\text{COH}(\text{CH}_3)\text{CO}_2^- + \text{Fe}(\text{CN})_5\text{NO}^{3-} \rightarrow \text{Fe}(\text{CN})_5\text{N}(\text{O})\text{CH}_2\text{COH}(\text{CH}_3)\text{CO}_2^{\cdot}$	$(6.3 \pm 0.9) \times 10^8$	6.0–7.5	p.r.	D.k. at 380 nm (nitrosyl radical, $\epsilon = 3.5 \times 10^3$ L mol <sup>-1</sup> cm <sup>-1</sup> ), as well as p.b.k. in soln. contg. 0.3 mol L <sup>-1</sup> 2-hydroxyisobutyrate ion and 5 x 10 <sup>-4</sup> mol L <sup>-1</sup> Fe(CN) <sub>5</sub> NO <sup>2-</sup> .	79A134
71.055	$\text{CH}_3\text{CON}(\text{CH}_3)\dot{\text{C}}\text{H}_2 + \text{Fe}(\text{CN})_5\text{NO}^{3-} \rightarrow \text{Fe}(\text{CN})_5\text{N}(\text{O})\text{CH}_2\text{N}(\text{CH}_3)\text{C}(\text{O})\text{CH}_3^{\cdot}$	$(3.5 \pm 0.5) \times 10^{10}$	6.0–7.5	p.r.	D.k. at 380 nm (nitrosyl radical, $\epsilon = 3.5 \times 10^3$ L mol <sup>-1</sup> cm <sup>-1</sup> ), as well as p.b.k. in soln. contg. 0.3 mol L <sup>-1</sup> <i>N,N</i> -dimethylacetamide and 5 x 10 <sup>-4</sup> mol L <sup>-1</sup> Fe(CN) <sub>5</sub> NO <sup>2-</sup> .	79A134
72.	<b>Tris(1,10-phenanthroline)iron(III) ion</b>					
72.016	$\cdot\text{CH}_2\text{C}(\text{CH}_3)_2\text{OH} + \text{Fe}(\text{phen})_3^{3+} \rightarrow \text{Fe}(\text{phen})_3^{2+}$	$\sim 10^7$	acid	p.r.	P.b.k. in soln. contg. <i>tert</i> -BuOH, H <sub>2</sub> SO <sub>4</sub> and HClO <sub>4</sub> ; slower process follows fast H reaction.	79A174
	<i>Deuterohemin See 222.</i>					
	<i>Hemin See 224.</i>					
	<i>Hemin c See 225.</i>					
	<i>Methemerythrin See 256.</i>					
	<b>Ga</b>					
73.	<b>Gallium(II) ions</b>					
73.075	$\cdot\text{CH}_2\text{OH} + \text{Ga}^{2+} \rightarrow \text{CH}_2\text{O} + \text{H}^+ + \text{Ga}^+$	$1.1 \times 10^9$	2.3	p.r.	D.k. in soln. contg. MeOH; Ga(II) formed from $e_{\text{aq}}^- + \text{Ga}(\text{III})$ ; cor. to $I = 0$ .	79A190
	$\cdot\text{CH}_2\text{OH} + \text{Ga}(\text{OH})^+ \rightarrow \text{CH}_2\text{O} + \text{H}_2\text{O} + \text{Ga}^+$	$1.0 \times 10^9$	2.9			
	$\cdot\text{CH}_2\text{O}^- + \text{Ga}(\text{OH})_6^{4+} \rightarrow \text{prod.}$	$7.8 \times 10^8$	12.0			
73.076	$\cdot\text{CH}_3\dot{\text{C}}\text{HO} + \text{Ga}(\text{OH})_6^{4+} \rightarrow \text{prod.}$	$1.2 \times 10^9$	12.0	p.r.	D.k. in soln. contg. EtOH; Ga(II) from $e_{\text{aq}}^- + \text{Ga}(\text{III})$ ; cor. to $I = 0$ .	79A190
73.078	$(\text{CH}_3)_2\dot{\text{C}}\text{O}^- + \text{Ga}(\text{OH})_6^{4+} \rightarrow \text{prod.}$	$1.7 \times 10^9$	12.0	p.r.	D.k. in soln. contg. 2-PrOH; Ga(II) from $e_{\text{aq}}^- + \text{Ga}(\text{III})$ ; cor. to $I = 0$ .	79A190
	<b>Hg</b>					
74.	<b>Mercuric bromide</b>					
74.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{HgBr}_2 \rightarrow \text{HgBr} + \text{Br}^- + \text{H}^+ + (\text{CH}_3)_2\text{CO}$	$(2.4 \pm 0.6) \times 10^9$		p.r.	P.b.k. in N <sub>2</sub> O-satd. 0.1 mol L <sup>-1</sup> 2-PrOH soln.	76A042
74.147	$\cdot\text{CO}_2^- + \text{HgBr}_2 \rightarrow \text{CO}_2 + \text{Hg}(\text{I})$	$\leq 9 \times 10^9$		p.r.	P.b.k. at 360 nm in soln. contg. formate ion; based on max. optical density in various solns.; rel. rates are $\cdot\text{CO}_2^-$ 1.0, (CH <sub>3</sub> ) <sub>2</sub> ĊOH 0.89, CH <sub>3</sub> ĊOH 0.87, and $\cdot\text{CH}_2\text{OH}$ 0.63.	76A087
75.	<b>Mercuric chloride</b>					
75.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{HgCl}_2 \rightarrow \text{HgCl} + \text{Cl}^- + \text{H}^+ + (\text{CH}_3)_2\text{CO}$	$(2.0 \pm 0.2) \times 10^9$		p.r.	P.b.k. in N <sub>2</sub> O-satd. 0.1 mol L <sup>-1</sup> 2-PrOH soln.	73G043 76A042
76.	<b>Mercuric iodide</b>					
76.076	$\text{CH}_3\dot{\text{C}}\text{HOH} + \text{HgI}_2$	$(7 \pm 2.5) \times 10^8$		p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. EtOH.	78A165

TABLE 1. Rate constants for reactions of aliphatic radicals with inorganic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L. mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
76.078	(CH <sub>3</sub> ) <sub>2</sub> ĊOH + HgI <sub>2</sub> → HgI + I <sup>-</sup> + H <sup>+</sup> + (CH <sub>3</sub> ) <sub>2</sub> CO	(2.0 ± 0.5) × 10 <sup>9</sup> (1.0 ± 0.5) × 10 <sup>9</sup>		p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> 2-PrOH.	76A042 78A165
76.147	·CO <sub>2</sub> <sup>-</sup> + HgI <sub>2</sub>	(3.0 ± 1.0) × 10 <sup>9</sup>		p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. formate ion.	78A165
77.	<b>Mercurous cyanide</b>					
77.016	·CH <sub>2</sub> C(CH <sub>3</sub> ) <sub>2</sub> OH + HgCN	1.6 × 10 <sup>9</sup>		p.r.	Calcd. from increase in decay rate at 285 nm in soln. contg. <i>tert</i> -BuOH and Hg(CN) <sub>2</sub> ; 2 <i>k</i> (HgCN + HgCN) = 3.4 × 10 <sup>9</sup> .	75A203
77.075	·CH <sub>2</sub> OH + HgCN	4.0 × 10 <sup>9</sup>		p.r.	Calcd. from increase in decay rate at 285 nm in soln. contg. MeOH and Hg(CN) <sub>2</sub> ; 2 <i>k</i> (HgCN + HgCN) = 3.4 × 10 <sup>9</sup> .	75A203
77.076	CH <sub>3</sub> ĊHOH + HgCN	3.9 × 10 <sup>9</sup>		p.r.	Calcd. from increase in decay rate at 285 nm in soln. contg. EtOH and Hg(CN) <sub>2</sub> ; 2 <i>k</i> (HgCN + HgCN) = 3.4 × 10 <sup>9</sup> .	75A203
77.078	(CH <sub>3</sub> ) <sub>2</sub> ĊOH + HgCN	2.4 × 10 <sup>9</sup>		p.r.	Calcd. from increase in decay rate at 285 nm in soln. contg. 2-PrOH and Hg(CN) <sub>2</sub> ; 2 <i>k</i> (HgCN + HgCN) = 3.4 × 10 <sup>9</sup> .	75A203
78.	<b>Mercuric cyanide</b>					
78.147	·CO <sub>2</sub> <sup>-</sup> + Hg(CN) <sub>2</sub> → CO <sub>2</sub> + Hg(I)	(3.4 ± 0.2) × 10 <sup>9</sup>		p.r.	P.b.k. at 285 nm in N <sub>2</sub> O-satd. soln. contg. formate.	75A203
79.	<b>Mercuric thiocyanate</b>					
79.078	(CH <sub>3</sub> ) <sub>2</sub> ĊOH + Hg(SCN) <sub>2</sub> → HgSCN + SCN <sup>-</sup> + H <sup>+</sup> + (CH <sub>3</sub> ) <sub>2</sub> CO	(2.2 ± 0.5) × 10 <sup>9</sup>		p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> 2-PrOH.	76A042
	<b>I</b>					
80.	<b>Iodine</b>					
80.001	·CH <sub>3</sub> + I <sub>2</sub> → [CH <sub>3</sub> I <sub>2</sub> ]	6.0 × 10 <sup>9</sup> (rel.)		p.r.	C.k. with O <sub>2</sub> ; radical from MeI; rel. to <i>k</i> (CH <sub>3</sub> + O <sub>2</sub> ) = 4.7 × 10 <sup>9</sup> .	67G041
81.	<b>Iodate ion</b>					
81.076	CH <sub>3</sub> ĊHOH + IO <sub>3</sub> <sup>-</sup> CH <sub>3</sub> ĊHO <sup>-</sup> + IO <sub>3</sub> <sup>-</sup>	< 5 × 10 <sup>6</sup> (7.5 ± 0.2) × 10 <sup>8</sup>	6 11.8	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. EtOH.	72A018
	<b>Ir</b>					
	<b>Iridium(IV) ions</b>					
81a.	<b>Hexachloroiridate(IV) ion</b>					
81a.001	·CH <sub>3</sub> + IrCl <sub>6</sub> <sup>2-</sup>	(1.15 ± 0.5) × 10 <sup>9</sup>	6-7	p.r.	D.k. at 490 nm in N <sub>2</sub> O-satd. soln.; radical from dimethyl sulfoxide.	81A003
81a.002	·CH <sub>2</sub> CH <sub>3</sub> + IrCl <sub>6</sub> <sup>2-</sup>	(3.1 ± 0.8) × 10 <sup>9</sup>	6-7	p.r.	D.k. at 490 nm in N <sub>2</sub> O-satd. soln.; radical from diethyl sulfoxide.	81A003
81a.002a	(CH <sub>3</sub> ) <sub>2</sub> ĊH + IrCl <sub>6</sub> <sup>2-</sup>	(3.6 ± 0.4) × 10 <sup>9</sup>	6-7	p.r.	D.k. at 490 nm in N <sub>2</sub> O-satd. soln.; radical from di-(1-methylethyl) sulfoxide.	81A003
81a.002b	(CH <sub>3</sub> ) <sub>3</sub> Ċ + IrCl <sub>6</sub> <sup>2-</sup>	(3.8 ± 1.1) × 10 <sup>9</sup>	6-7	p.r.	D.k. at 490 nm in N <sub>2</sub> O-satd. soln.; radical from di-( <i>tert</i> -butyl) sulfoxide.	81A003
81a.005	·CH <sub>2</sub> CH <sub>2</sub> Cl + IrCl <sub>6</sub> <sup>2-</sup>	~ 1 × 10 <sup>9</sup>	6-7	p.r.	D.k. at 490 nm in N <sub>2</sub> O-satd. soln. contg. 1,2-dichloroethane.	81A003
81a.014	·CH <sub>2</sub> CH <sub>2</sub> OH + IrCl <sub>6</sub> <sup>2-</sup>	~ 2 × 10 <sup>9</sup>	6-7	p.r.	D.k. at 490 nm in N <sub>2</sub> O-satd. soln. contg. ethylene.	81A003
81a.016	·CH <sub>2</sub> C(CH <sub>3</sub> ) <sub>2</sub> OH + IrCl <sub>6</sub> <sup>2-</sup>	(1.2 ± 0.16) × 10 <sup>9</sup>	6-7	p.r.	D.k. at 490 nm in N <sub>2</sub> O-satd. soln. contg. <i>tert</i> -BuOH.	81A003
81a.020	·CH <sub>2</sub> CHO + IrCl <sub>6</sub> <sup>2-</sup>	1.7 × 10 <sup>9</sup>	7	p.r.	D.k. at 490 nm in soln. contg. 2-chloroethanol.	81A003

TABLE 1. Rate constants for reactions of aliphatic radicals with inorganic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
81a.035	$\cdot\text{CH}_2\text{CO}_2^- + \text{IrCl}_6^{2-}$	$4.2 \times 10^8$	7	p.r.	D.k. at 490 nm in N <sub>2</sub> O-satd. soln.	81A003
	$\cdot\text{CH}_2\text{CO}_2\text{H} + \text{IrCl}_6^{2-}$	$1.4 \times 10^9$	3.3		contg. acetate.	
81a.040a	$\cdot\text{O}_2\text{C}\dot{\text{C}}\text{HCH}_2\text{CO}_2^- + \text{IrCl}_6^{2-}$	$1.1 \times 10^8$	7	p.r.	D.k. at 490 nm in N <sub>2</sub> O-satd. soln.	81A003
	$\text{HO}_2\text{C}\dot{\text{C}}\text{HCH}_2\text{CO}_2\text{H} + \text{IrCl}_6^{2-}$	$4.6 \times 10^8$	3.3		contg. succinate.	
81a.043	$\cdot\text{CH}_2\text{Cl} + \text{IrCl}_6^{2-}$	$\sim 1 \times 10^9$	6-7	p.r.	D.k. at 490 nm in N <sub>2</sub> O-satd. soln.	81A003
					contg. dichloromethane.	
81a.048	$\cdot\text{CCl}_3 + \text{IrCl}_6^{2-}$	$2.8 \times 10^7$	6-7	p.r.	D.k. at 490 nm in N <sub>2</sub> O-satd. soln.	81A003
					contg. carbon tetrachloride.	
81a.075	$\cdot\text{CH}_2\text{OH} + \text{IrCl}_6^{2-}$	$6.0 \times 10^9$	6-7	p.r.	D.k. at 490 nm in N <sub>2</sub> O-satd. soln.	81A003
					contg. MeOH.	
81a.076	$\text{CH}_3\dot{\text{C}}\text{HOH} + \text{IrCl}_6^{2-}$	$4.5 \times 10^9$	6-7	p.r.	D.k. at 490 nm in N <sub>2</sub> O-satd. soln.	81A003
					contg. EtOH.	
81a.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{IrCl}_6^{2-}$	$4.7 \times 10^9$	6-7	p.r.	D.k. at 490 nm in N <sub>2</sub> O-satd. soln.	81A003
					contg. 2-PrOH.	
81a.092	$\cdot\text{CH}_2\text{OCH}_3 + \text{IrCl}_6^{2-}$	$6.5 \times 10^9$	6-7	p.r.	D.k. at 490 nm in N <sub>2</sub> O-satd. soln.	81A003
					contg. dimethyl ether.	
81a.093	$\text{CH}_3\dot{\text{C}}\text{HOC}_2\text{H}_5 + \text{IrCl}_6^{2-}$	$5.7 \times 10^9$	6-7	p.r.	D.k. at 490 nm in N <sub>2</sub> O-satd. soln.	81A003
					contg. diethyl ether.	
81a.104	$-\text{CH}_2\dot{\text{C}}\text{HOCH}_2\text{CH}_2\text{O}- + \text{IrCl}_6^{2-}$	$5.4 \times 10^9$	6-7	p.r.	D.k. at 490 nm in N <sub>2</sub> O-satd. soln.	81A003
					contg. dioxane.	
81a.115	$\cdot\text{CHOHCO}_2\text{H} + \text{IrCl}_6^{2-}$	$2.3 \times 10^9$	3.3	p.r.	D.k. at 490 nm in N <sub>2</sub> O-satd. soln.	81A003
	$\cdot\text{CHOHCO}_2^- + \text{IrCl}_6^{2-}$	$2.0 \times 10^9$	6.9		contg. glycolate.	
	$\cdot\text{CH}(\text{O}^-)\text{CO}_2^- + \text{IrCl}_6^{2-}$	$1.8 \times 10^9$	10.7			
81a.147	$\cdot\text{CO}_2^- + \text{IrCl}_6^{2-}$	$1.7 \times 10^9$	6-7	p.r.	D.k. at 490 nm in N <sub>2</sub> O-satd. soln.	81A003
					contg. formate.	
<b>Mn</b>						
82.	<b>Manganese(II) ions</b>					
82.147	$\cdot\text{CO}_2^- + \text{Mn}^{2+} \rightarrow \text{CO}_2 + \text{Mn}^+$	$< 2 \times 10^5$		p.r.	No effect of Mn <sup>2+</sup> on d.k. of $\cdot\text{CO}_2^-$ at 280 or 256 nm in N <sub>2</sub> O-satd. soln. contg. 10 <sup>-2</sup> mol L <sup>-1</sup> formate.	76A109
83.	<b>Permanganate ion</b>					
83.001	$\cdot\text{CH}_3 + \text{MnO}_4^-$	$1.05 \times 10^9$	6-7	p.r.	D.k. at 545 nm in N <sub>2</sub> O-satd. soln.; radical from dimethyl sulfoxide.	81A003
83.002	$\cdot\text{CH}_2\text{CH}_3 + \text{MnO}_4^-$	$\sim 2 \times 10^9$	6-7	p.r.	D.k. at 545 nm in N <sub>2</sub> O-satd. soln. radical from diethyl sulfoxide.	81A003
83.016	$\cdot\text{CH}_2\text{C}(\text{CH}_3)_2\text{OH} + \text{MnO}_4^-$	$1.3 \times 10^9$	6-7	p.r.	D.k. at 545 nm in N <sub>2</sub> O-satd. soln. contg. <i>tert</i> -BuOH.	81A003
83.043	$\cdot\text{CH}_2\text{Cl} + \text{MnO}_4^-$	$\sim 1 \times 10^9$	6-7	p.r.	D.k. at 545 nm in N <sub>2</sub> O-satd. soln. contg. dichloromethane.	81A033
83.045	$\cdot\text{CHCl}_2 + \text{MnO}_4^-$	$\sim 1 \times 10^9$	6-7	p.r.	D.k. at 545 nm in N <sub>2</sub> O-satd. soln. contg. chloroform.	81A003
83.048	$\cdot\text{CCl}_3 + \text{MnO}_4^-$	$\sim 4 \times 10^8$	6-7	p.r.	D.k. at 545 nm in N <sub>2</sub> O-satd. soln. contg. carbon tetrachloride.	81A003
83.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{MnO}_4^-$	$(4.2 \pm 0.4) \times 10^9$	7.0	p.r.	D.k. at 545 nm in N <sub>2</sub> O-satd. soln. contg. 2-PrOH.	73A104
83.097	$\text{CH}_3\dot{\text{C}}(\text{O}^-)\text{CH}_2\text{CO}_2^- + \text{MnO}_4^-$	$(4.8 \pm 0.5) \times 10^9$	9.2	p.r.	D.k. at 545 nm in Ar-satd. soln. contg. acetoacetate and <i>tert</i> -BuOH.	73A104
83.104	$-\text{CH}_2\dot{\text{C}}\text{HOCH}_2\text{CH}_2\text{O}- + \text{MnO}_4^-$	$(6.5 \pm 1.3) \times 10^9$	6-7	p.r.	D.k. at 545 nm in N <sub>2</sub> O-satd. soln. contg. dioxane.	81A003
<b>Nitrogen compounds</b>						
84.	<b>Hydroxylamine</b>					
84.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{NH}_2\text{OH} \rightarrow \cdot\text{NH}_2$	$< 3 \times 10^3$	<2	chem.	Est. from esr in Ti(III)-NH <sub>2</sub> OH soln. contg. 2-PrOH.	76D419

TABLE 1. Rate constants for reactions of aliphatic radicals with inorganic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
85. 85.078	<b>Nitrous oxide</b> (CH <sub>3</sub> ) <sub>2</sub> ĊO + N <sub>2</sub> O	(3.8 ± 0.4) × 10 <sup>4</sup> (rel.)	13.5	γ-r.	Est. from $G$ (acetone) based on an assumed mechanism and values for competing reactions.	72G167
86. 86.076	<b>Nitrite ion</b> CH <sub>3</sub> ĊHOH + NO <sub>2</sub> <sup>-</sup>	< 5 × 10 <sup>6</sup>	6	p.r.	D.k. in N <sub>2</sub> O-satd. EtOH soln.	72A018
87. 87.076 87.078	<b>Nitrate ion</b> CH <sub>3</sub> ĊHOH + NO <sub>3</sub> <sup>-</sup> (CH <sub>3</sub> ) <sub>2</sub> ĊOH + NO <sub>3</sub> <sup>-</sup>	< 5 × 10 <sup>6</sup> 28	6	p.r. γ-r.	D.k. in N <sub>2</sub> O-satd. EtOH soln. Calcd. from $G$ for destruction of NO <sub>3</sub> <sup>-</sup> in soln. of 0.1–0.2 mol L <sup>-1</sup> acetone, 0.2–0.4 mol L <sup>-1</sup> 2-PrOH and 2.5 × 10 <sup>-4</sup> mol L <sup>-1</sup> Ag <sup>+</sup> and 10 <sup>-3</sup> mol L <sup>-1</sup> Na dodecylsulfate assuming $G(R) = 5.8$ and $2k(R + R) = 1.4 \times 10^9$ .	72A018 80N062
<b>Ni</b>						
88. 88.004	<b>Nickel(I) ion</b> <i>c</i> -Ċ <sub>5</sub> H <sub>9</sub> + Ni <sup>+</sup> → C <sub>5</sub> H <sub>9</sub> Ni <sup>+</sup>	2.8 × 10 <sup>9</sup>		p.r.	D.k. at 300 nm (as well as p.b.k.) in soln. contg. NiSO <sub>4</sub> and cyclopentane.	74A037
88.016	·CH <sub>2</sub> C(CH <sub>3</sub> ) <sub>2</sub> OH + Ni <sup>+</sup> → Ni <sup>2+</sup> + CH <sub>2</sub> =C(CH <sub>3</sub> ) <sub>2</sub> + OH <sup>-</sup>	3 × 10 <sup>9</sup>		p.r.	D.k. at 300 nm (Ni <sup>+</sup> ) in soln. contg. NiSO <sub>4</sub> and <i>tert</i> -BuOH; assume $G(\text{Ni}^+) = G(R) = 2.7$ .	74A037
88.075	·CH <sub>2</sub> OH + Ni <sup>+</sup> → NiCH <sub>2</sub> OH <sup>+</sup>	4.2 × 10 <sup>9</sup>		p.r.	D.k. at 300 nm (as well as p.b.k. at 250 nm); assume $G(\text{Ni}^+) = G(R) = 3.2$ ; soln. contains NiSO <sub>4</sub> and MeOH.	74A037
88.076	CH <sub>3</sub> ĊHOH + Ni <sup>+</sup> → NiCHOHCH <sub>3</sub> <sup>+</sup>	2.3 × 10 <sup>9</sup>		p.r.	D.k. at 300 nm (as well as p.b.k.) in soln. cont. NiSO <sub>4</sub> and EtOH.	74A037
88.078	(CH <sub>3</sub> ) <sub>2</sub> ĊOH + Ni <sup>+</sup> → NiC(OH)(CH <sub>3</sub> ) <sub>2</sub> <sup>+</sup>	1.4 × 10 <sup>9</sup>		p.r.	D.k. at 300 nm (as well as p.b.k.) in soln. contg. NiSO <sub>4</sub> and 2-PrOH.	74A037
88.147	·CO <sub>2</sub> <sup>-</sup> + Ni <sup>+</sup> → NiCO <sub>2</sub>	6.6 × 10 <sup>9</sup>	5.0	p.r.	D.k. at 300 nm (as well as p.b.k.) in soln. contg. NiSO <sub>4</sub> and formate ion.	74A037
89. 89.016	<b>Nickel(II) ions</b> ·CH <sub>2</sub> C(CH <sub>3</sub> ) <sub>2</sub> OH + Ni <sup>2+</sup>	< 10 <sup>6</sup>		p.r.	Est. from lack of increase in Ni <sup>+</sup> in 0.1 mol L <sup>-1</sup> Ni <sup>2+</sup> on addn. of 0.1 mol L <sup>-1</sup> <i>tert</i> -BuOH.	75A027
89.075	·CH <sub>2</sub> OH + Ni <sup>2+</sup>	< 10 <sup>2</sup>		p.r.	Est. from lack of increase in Ni <sup>+</sup> in 0.1 mol L <sup>-1</sup> Ni <sup>2+</sup> on addn. of 0.1 mol L <sup>-1</sup> MeOH.	75A027
89.078	(CH <sub>3</sub> ) <sub>2</sub> ĊOH + Ni <sup>2+</sup>	< 10 <sup>6</sup>		p.r.	Est. from lack of increase in Ni <sup>+</sup> in 0.1 mol L <sup>-1</sup> Ni <sup>2+</sup> on addn. of 0.1 mol L <sup>-1</sup> 2-PrOH.	75A027
89.147	·CO <sub>2</sub> <sup>-</sup> + Ni <sup>2+</sup> → CO <sub>2</sub> + Ni <sup>+</sup>	10 <sup>2</sup> < $k$ < 10 <sup>5</sup>		p.r.	Est. from lack of increase in Ni <sup>+</sup> in 0.1 mol L <sup>-1</sup> Ni <sup>2+</sup> on addn. of 0.1 mol L <sup>-1</sup> formate ion.	75A027
90. 90.147	<b>Tetracyanonickelate(II) ion</b> ·CO <sub>2</sub> <sup>-</sup> + Ni(CN) <sub>4</sub> <sup>2-</sup> → CO <sub>2</sub> + Ni(CN) <sub>4</sub> <sup>3-</sup>	(1.2 ± 0.1) × 10 <sup>9</sup>		p.r.	P.b.k. at 240 nm in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> formate ion.	74A072
91. 91.147	<b>(5,7,7,12,12,14-Hexamethyl-1,4,8,11-tetraazacyclotetradecane)nickel(II) ion</b> ·CO <sub>2</sub> + Ni <sup>II</sup> L → Ni <sup>I</sup> L + CO <sub>2</sub>	5.7 × 10 <sup>9</sup>	7.0	p.r.	P.b.k. in Ar-satd. soln. contg. 0.1 mol L <sup>-1</sup> formate; Ni(I) is also formed by reaction of e <sub>aq</sub> <sup>-</sup> .	76A039
92. 92.147	<b>(5,7,7,12,12,14)Hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-diene)nickel(II) ion</b> ·CO <sub>2</sub> + Ni <sup>II</sup> L → Ni <sup>I</sup> L + CO <sub>2</sub>	6.7 × 10 <sup>9</sup>	7.0	p.r.	P.b.k. in Ar-satd. 0.1 mol L <sup>-1</sup> formate.	76A039

TABLE 1. Rate constants for reactions of aliphatic radicals with inorganic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
93.	<b>Oxygen</b>					
93.001	$\cdot\text{CH}_3 + \text{O}_2 \rightarrow \text{CH}_3\text{O}_2\cdot$	$(4.7 \pm 0.7) \times 10^9$	nat	p.r.	P.b.k. at 260 nm in soln. contg. CH <sub>3</sub> Br, O <sub>2</sub> and N <sub>2</sub> O or SCN <sup>-</sup> ; $E_a = 3.5 \pm 0.5$ kcal mol <sup>-1</sup> (14.6 kJ mol <sup>-1</sup> ).	67G041
		$(3.2 \pm 0.4) \times 10^8$	5.5	p.r.	P.b.k. at 250 nm in soln. contg. CH <sub>4</sub> and O <sub>2</sub> .	72G445
93.002	$\cdot\text{CH}_2\text{CH}_3 + \text{O}_2 \rightarrow \text{C}_2\text{H}_5\text{O}_2\cdot$	$(2.9 \pm 0.8) \times 10^9$	nat	p.r.	P.b.k. at 270 nm in soln. contg. $6 \times 10^{-5}$ mol L <sup>-1</sup> O <sub>2</sub> and ethane.	75A055
93.004	$c\text{-}\dot{\text{C}}_5\text{H}_9 + \text{O}_2 \rightarrow \text{RO}_2\cdot$	$(4.9 \pm 0.6) \times 10^9$	7	p.r.	P.b.k. at 270 nm in N <sub>2</sub> O-satd. soln. contg. cyclopentane.	74A051
93.007	$\text{R} + \text{O}_2 \rightarrow \text{RO}_2\cdot$ (R = Radicals from oleate)	$1.0 \times 10^9$	13	p.r.	P.b.k. at 280 nm in O <sub>2</sub> -N <sub>2</sub> O-contg. $\sim 0.4\text{--}0.8 \times 10^{-3}$ mol L <sup>-1</sup> soap soln.	78A365
93.008	$\text{R} + \text{O}_2 \rightarrow \text{RO}_2\cdot$ (R = Radicals from linoleate)	$3 \times 10^9$	10.5, 13	p.r.	D.k. at 280 nm in O <sub>2</sub> -N <sub>2</sub> O-contg. soln. of $10^{-5}$ mol L <sup>-1</sup> soap and 0.02 mol L <sup>-1</sup> phosphate.	78A365
93.009	$\text{R} + \text{O}_2 \rightarrow \text{RO}_2\cdot$ (R = Radicals from linolenate)	$3 \times 10^8$	10.5, 13	p.r.	D.k. at 280 nm in O <sub>2</sub> -N <sub>2</sub> O-contg. soln. of $0.4\text{--}0.8 \times 10^{-3}$ mol L <sup>-1</sup> soap.	78A365
93.010	$\text{R} + \text{O}_2 \rightarrow \text{RO}_2\cdot$ (R = Radicals from arachidonate)	$2 \times 10^8$	13	p.r.	D.k. at 280 nm in O <sub>2</sub> -N <sub>2</sub> O-contg. soln. of $\sim 0.4\text{--}0.8 \times 10^{-3}$ mol L <sup>-1</sup> soap.	78A365
93.014	$\cdot\text{CH}_2\text{CH}_2\text{OH} + \text{O}_2 \rightarrow \cdot\text{O}_2\text{CH}_2\text{CH}_2\text{OH}$	$(6.6 \pm 1.3) \times 10^9$	1	p.r.	P.b.k. at 240 nm; radical from OH addn. in soln. contg. ethylene-O <sub>2</sub> (99:1); includes O <sub>2</sub> reaction with $\cdot\text{C}_2\text{H}_5$ from H addn.	67G269
93.035	$\cdot\text{CH}_2\text{CO}_2^- + \text{O}_2 \rightarrow \cdot\text{O}_2\text{CH}_2\text{CO}_2^-$	$(5.0 \pm 0.8) \times 10^8$	4-9	p.r.	D.k. at 350 nm in N <sub>2</sub> O-satd. soln. contg. acetate ion.	73A052
		$(2.1 \pm 0.3) \times 10^9$	8.2	p.r.	D.k. at 366 nm in N <sub>2</sub> O-satd. 0.01 mol L <sup>-1</sup> acetate soln.; cor. for $k(\text{R} + \text{R}) = 5.5 \times 10^8$ .	76A082
93.036	$\cdot\text{CH}_2\text{CO}_2\text{CH}_3 + \text{O}_2 \rightarrow \cdot\text{O}_2\text{CH}_2\text{CO}_2\text{CH}_3$	$(1.8 \pm 0.2) \times 10^9$	4	p.r.	D.k. at 340 nm in soln. contg. methyl chloroacetate and formate ion.	78A402
93.052	$\text{CH}_3\dot{\text{C}}\text{HN}^+(\text{C}_2\text{H}_5)_3 + \text{O}_2 \rightarrow \text{addn.}$		13	p.r.	Est. that $k(\text{R} + \text{R})/k(\text{R} + \text{O}_2) \approx 10$ .	78A095
93.057	$\text{NH}_2\dot{\text{C}}\text{HCO}_2^- + \text{O}_2$	$\sim 1 \times 10^9$	7.9	p.r.	D.k. at 307 nm in O <sub>2</sub> -N <sub>2</sub> O-satd. 0.2 mol L <sup>-1</sup> glycine soln.; c.k. with ferricyanide also gave $\sim 10^9$ assuming $2k(\text{R} + \text{ferricyanide}) = 1 \times 10^9$ .	76A082
93.062	$\text{R} + \text{O}_2 \rightarrow \text{RO}_2\cdot$ (R = Radical from glycine anhydride)	$(1.2 \pm 0.1) \times 10^9$ $(2.8 \pm 0.3) \times 10^8$	5.0 12.0	p.r.	D.k. at 360 nm in N <sub>2</sub> O-satd. soln. contg. glycine anhydride.	71G554
93.063	$\text{R} + \text{O}_2 \rightarrow \text{RO}_2\cdot$ (R = Radical from alanine anhydride)	$(1.0 \pm 0.2) \times 10^9$ $(1.1 \pm 0.2) \times 10^9$	5.4 12.0	p.r.	D.k. at 360 nm in N <sub>2</sub> O-satd. soln. alanine anhydride.	71G554
93.064	$\text{R} + \text{O}_2 \rightarrow \text{RO}_2\cdot$ (R = Radical from sarcosine anhydride)	$(9 \pm 2) \times 10^8$	5.2	p.r.	D.k. at 360 nm in N <sub>2</sub> O-satd. soln. contg. sarcosine anhydride.	71G554
93.067	$\text{R} + \text{O}_2 \rightarrow \text{RO}_2\cdot$ (R = Radicals from acetyldiglycine)	$(5.5 \pm 0.8) \times 10^8$	5.5	p.r.	D.k. at 330 nm in N <sub>2</sub> O-satd. soln. contg. acetyldiglycine.	73A052
93.075	$\cdot\text{CH}_2\text{OH} + \text{O}_2 \rightarrow \cdot\text{O}_2\text{CH}_2\text{OH}$	$4.9 \times 10^9$ (rel.)	7	p.r.	C.k. in 0.1 mol L <sup>-1</sup> MeOH soln. contg. ferricyanide; $k(\text{R} + \text{ferricyanide}) = 4.0 \times 10^9$ .	69G522
		$(4.2 \pm 0.5) \times 10^9$	10.7	p.r.	Calcd. from abs. at 248 nm assuming $k[\text{O}_2] =$ rate of O <sub>2</sub> <sup>-</sup> formn. from peroxy radical.	74A099
93.076	$\text{CH}_3\dot{\text{C}}\text{HOH} + \text{O}_2 \rightarrow \cdot\text{O}_2\text{CHOHCH}_3$	$3.6 \times 10^8$ (rel.)	7	p.r.	C.k. with RNO [ $k(\text{R} + \text{RNO}) = 2.4 \times 10^9$ ].	69G156
		$4.6 \times 10^9$ (rel.)	7	p.r.	C.k. in 0.1 mol L <sup>-1</sup> EtOH soln. contg. ferricyanide; $k(\text{R} + \text{ferricyanide}) = 5.3 \times 10^9$ .	69G522
93.077	$\text{CH}_3\text{CH}_2\dot{\text{C}}\text{HOH} + \text{O}_2$	$4.7 \times 10^9$ (rel.)	7	p.r.	C.k. in 0.1 mol L <sup>-1</sup> 1-PrOH soln. contg. ferricyanide; $k(\text{R} + \text{ferricyanide}) = 5.3 \times 10^9$ .	69G522

TABLE 1. Rate constants for reactions of aliphatic radicals with inorganic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
93.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{O}_2 \rightarrow$	$6.2 \times 10^8$ (rel.)	7	p.r.	C.k. with RNO [ $k(\text{R} + \text{RNO}) = 3.2 \times 10^9$ ].	69G156
	$(\text{CH}_3)_2\text{C}(\text{OH})\text{O}_2\cdot$	$4.2 \times 10^9$ (rel.)	7	p.r.	C.k. in 0.1 mol L <sup>-1</sup> 2-PrOH soln. contg. ferricyanide; $k(\text{R} + \text{ferricyanide}) = 4.7 \times 10^9$ .	69G522
		$3.5 \times 10^9$ (rel.)	5-6	p.r.	C.k. in N <sub>2</sub> O-satd. 0.1 mol L <sup>-1</sup> 2-PrOH soln. with <i>p</i> -nitroacetophenone; $k(\text{R} + \text{PNAP}) = 3.8 \times 10^9$ .	71G618
		$(4.5 \pm 0.5) \times 10^9$	~1	p.r.	D.k. at 290-300 nm in air-satd. soln. contg. 1 mol L <sup>-1</sup> 2-PrOH and 0.5 mol L <sup>-1</sup> HClO <sub>4</sub> .	74A074
93.080	$\text{CH}_3\text{CH}_2\dot{\text{C}}\text{OHCH}_3 + \text{O}_2$	$4.0 \times 10^9$ (rel.)	7	p.r.	C.k. in soln. contg. 0.3 mol L <sup>-1</sup> 2-BuOH with ferricyanide; $k(\text{R} + \text{ferricyanide}) = 4.8 \times 10^9$ .	69G522
93.081	$(\text{CH}_3)_2\text{CH}\dot{\text{C}}\text{HOH} + \text{O}_2$	$3.4 \times 10^9$ (rel.)	7	p.r.	C.k. in soln. contg. 0.3 mol L <sup>-1</sup> 2-methyl-1-propanol with ferricyanide; $k(\text{R} + \text{ferricyanide}) = 3.0 \times 10^9$ .	69G522
93.090	$\text{CH}_3\text{CO}_2\dot{\text{C}}\text{H}_2 + \text{O}_2 \rightarrow \text{CH}_3\text{CO}_2\text{CH}_2\text{O}_2\cdot$	$(1.35 \pm 0.15) \times 10^{10}$	6.4	p.r.	P.b.k. at 260 nm as well as d.k. at 260 nm in soln. contg. methyl acetate and N <sub>2</sub> O.	78A402
93.100	$\cdot\text{CHOHCH}(\text{NH}_2)\text{CO}_2^- + \text{O}_2$	$2.4 \times 10^9$ (rel.)	7	p.r.	C.k. in 0.3 mol L <sup>-1</sup> serine soln. contg. ferricyanide; $k(\text{R} + \text{ferricyanide}) = 3.2 \times 10^9$ .	69G522
93.101	$\cdot\text{CHOHCH}_2\text{OH} + \text{O}_2$	$3.2 \times 10^9$ (rel.)	7	p.r.	C.k. in soln. contg. 0.3 mol L <sup>-1</sup> ethylene glycol with ferricyanide; $k(\text{R} + \text{ferricyanide}) = 3.6 \times 10^9$ .	69G522
93.105	$\text{R} + \text{O}_2$ (R = Radicals from polyethylene oxide)	$(1.9 - 2.9) \times 10^9$	7	p.r.	C.k. in soln. contg. ~2% polyethylene oxide with ferricyanide; $k(\text{R} + \text{ferricyanide}) = 2.1 \times 10^9$ .	69G522
93.106	$\cdot\text{CHOHCHOHCH}_2\text{OH} + \text{O}_2$ (+ CH <sub>2</sub> OH $\dot{\text{C}}\text{OHCH}_2\text{OH}$ )	$3.3 \times 10^9$ (rel.)	7	p.r.	C.k. in soln. contg. 0.4 mol L <sup>-1</sup> glycerol with ferricyanide; $k(\text{R} + \text{ferricyanide}) = 3.3 \times 10^9$ .	69G522
93.108	$\text{R} + \text{O}_2$ (R = Radicals from deoxyribose)	$2.0 \times 10^9$ (rel.)	5-6	p.r.	C.k. with ferricyanide in N <sub>2</sub> O-satd. soln. contg. deoxyribose; rel. to $k(\text{R} + \text{ferricyanide}) = 2.8 \times 10^9$ .	71G618
93.111	$\text{R} + \text{O}_2$ (R = Radicals from glucose)	$1.6 \times 10^9$ (rel.)	7	p.r.	C.k. in soln. contg. 0.3 mol L <sup>-1</sup> glucose and ferricyanide; $k(\text{R} + \text{ferricyanide}) = 1.9 \times 10^9$ .	69G522
93.113	$\cdot\text{A} + \text{O}_2$ (A = Radical from ascorbate)	$< 5 \times 10^2$	8.6	p.r.	D.k. at 360 nm in N <sub>2</sub> O-satd. soln. contg. ascorbate ion.	75A240
93.115	$\cdot\text{CHOHCO}_2^- + \text{O}_2$	$1.8 \times 10^9$ (rel.)	7	p.r.	Obs. rate of consumption of O <sub>2</sub> . C.k. in 0.3 mol L <sup>-1</sup> glycolate soln. contg. ferricyanide; $k(\text{R} + \text{ferricyanide}) = 5 \times 10^8$ .	78A417 69G522
93.117	$\text{CH}_3\dot{\text{C}}\text{OHCO}_2^- + \text{O}_2 \rightarrow$ $\text{CH}_3\text{C}(\dot{\text{O}}_2)(\text{OH})\text{CO}_2^-$	$2.6 \times 10^9$ (rel.)	7	p.r.	C.k. in 0.3 mol L <sup>-1</sup> lactate soln. contg. ferricyanide; $k(\text{R} + \text{ferricyanide}) = 1.5 \times 10^9$ .	69G522
		$(3.5 \pm 0.5) \times 10^9$	7.3	p.r.	D.k. at 270 nm in N <sub>2</sub> O-satd. soln. contg. lactate ion.	73A052
93.123	$\cdot\text{CH}(\text{OH})_2 + \text{O}_2 \rightarrow \cdot\text{O}_2\text{CH}(\text{OH})_2$ $\rightleftharpoons \cdot\text{O}_2\text{CH}(\text{OH})\text{O}^- + \text{H}^+$	$7.7 \times 10^8$	5.7	p.r.	D.k. at 250 nm in N <sub>2</sub> O-satd. soln. contg. formaldehyde, as well as condy. increase.	71G424
		$(4.5 \pm 0.7) \times 10^9$	3.5-6.5	p.r.	Condy. increase in oxygenated soln. contg. $5 \times 10^{-3}$ mol L <sup>-1</sup> formaldehyde; products are formate and H <sub>2</sub> O <sub>2</sub> .	80A282
93.126	$\text{CCl}_3\dot{\text{C}}(\text{OH})_2 + \text{O}_2 \rightarrow \cdot\text{O}_2\text{C}(\text{OH})_2\text{CCl}_3$	$(1.0 \pm 0.2) \times 10^8$	5.9	p.r.	D.k. at 250 nm in N <sub>2</sub> O-satd. soln. contg. chloral.	73G062
93.141	$\text{R} + \text{O}_2$ (R = Electron adduct of dimethyl fumarate)	$5.3 \times 10^9$	11	p.r.	D.k.	67G729
		$2.2 \times 10^9$		p.r.	D.k.	73G097

TABLE 1. Rate constants for reactions of aliphatic radicals with inorganic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
93.147	$\cdot\text{CO}_2^- + \text{O}_2 \rightarrow \text{CO}_2 + \text{O}_2^-$	$7.7 \times 10^8$ (rel.)	7	p.r.	C.k. with RNO in N <sub>2</sub> O-std. soln. contg. formate; $k(\text{R} + \text{RNO}) = 1.84 \times 10^9$ .	69G156
		$2.4 \times 10^9$ (rel.)	7	p.r.	C.k. with ferricyanide in 0.3 mol L <sup>-1</sup> formate soln.; $k(\text{R} + \text{ferricyanide}) = 1.06 \times 10^9$ .	69G522
		$(2.0 \pm 0.4) \times 10^9$	8.0	p.r.	P.b.k. at 260 nm in 0.1 mol L <sup>-1</sup> formate soln. satd. with oxygen.	76A072
		$(4.2 \pm 0.4) \times 10^9$	6.8	p.r.	D.k. at 270 nm and 300 nm in 0.18 mol L <sup>-1</sup> formate ion.	76A132
		$1 \times 10^9$ (rel.)	1-4	p.r.	Est. from buildup of C(NO <sub>2</sub> ) <sub>3</sub> <sup>-</sup> in O <sub>2</sub> -satd. 0.01 mol L <sup>-1</sup> HCO <sub>2</sub> H contg. C(NO <sub>2</sub> ) <sub>2</sub> ; rel. to $k(\text{R} + \text{TNM}) = 4 \times 10^9$ .(336.147)	78A177
94.	<b>Hydrogen peroxide</b>					
94.001	$\cdot\text{CH}_3 + \text{H}_2\text{O}_2$	$<10^6$	nat	p.r.	Addn. of 10 <sup>-3</sup> and 10 <sup>-2</sup> mol L <sup>-1</sup> H <sub>2</sub> O <sub>2</sub> had no effect on second order d.k. of $\cdot\text{CH}_3$ . Suggested that reaction is slow compared to R + R and may form HO <sub>2</sub> .	75A055
94.003	$\cdot\text{C}_5\text{H}_{11} + \text{H}_2\text{O}_2$	$3.4 \times 10^4$ (rel.)		$\gamma$ -r.	Est. from dose rate effect on C(H <sub>2</sub> O <sub>2</sub> ), assuming $2k(\text{R} + \text{R}) = 2 \times 10^9$ in soln. contg. $5 \times 10^{-3}$ mol L <sup>-1</sup> pentane and 10 <sup>-2</sup> mol L <sup>-1</sup> N <sub>2</sub> O.	76A254
94.004	$c\text{-}\dot{\text{C}}_5\text{H}_9 + \text{H}_2\text{O}_2$	$4.6 \times 10^4$ (rel.)		$\gamma$ -r.	Est. from dose rate effect on C(H <sub>2</sub> O <sub>2</sub> ), assuming $2k(\text{R} + \text{R}) = 1.5 \times 10^9$ in soln. contg. $2.5 \times 10^{-3}$ mol L <sup>-1</sup> cyclopentane and 10 <sup>-2</sup> mol L <sup>-1</sup> N <sub>2</sub> O.	76A254
94.016a	R + H <sub>2</sub> O <sub>2</sub> (R = Radicals from cyclopentene + OH, 73% addn., 23% abstraction)	$3.7 \times 10^4$ (rel.)		$\gamma$ -r.	Est. from dose rate effect on C(H <sub>2</sub> O <sub>2</sub> ), assuming $2k(\text{R} + \text{R}) = 1.5 \times 10^9$ , in soln. contg. $8.2 \times 10^{-3}$ mol L <sup>-1</sup> cyclopentene and 10 <sup>-2</sup> mol L <sup>-1</sup> N <sub>2</sub> O.	76A254
94.075	$\cdot\text{CH}_2\text{OH} + \text{H}_2\text{O}_2 \rightarrow \text{CH}_2\text{O} + \text{H}_2\text{O} + \text{OH}$	$(4.0 \pm 0.4) \times 10^4$ (rel.)		$\gamma$ -r.	Calcd. from dose rate effect on H <sub>2</sub> O <sub>2</sub> redn. in 0.99 mol L <sup>-1</sup> MeOH soln. assuming $2k(\text{R} + \text{R}) = 2.4 \times 10^9$ .	70G338
		$(2.3 \pm 0.8) \times 10^4$ (rel.)		chem.	Calcd. from esr of Ti(III)-H <sub>2</sub> O <sub>2</sub> soln. contg. MeOH and <i>tert</i> -BuOH; $2k(\text{R} + \text{R}) = 2 \times 10^9$ .	74D144
94.076	$\text{CH}_3\dot{\text{C}}\text{HOH} + \text{H}_2\text{O}_2 \rightarrow \text{CH}_3\text{CHO} + \text{H}_2\text{O} + \text{OH}$	$1.5 \times 10^5$ (rel.)		$\gamma$ -r.	Calcd. from dose rate effect on C(H <sub>2</sub> O <sub>2</sub> ) in soln. contg. EtOH assuming $2k(\text{R} + \text{R}) = 2.0 \times 10^9$ .	67G094
94.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{H}_2\text{O}_2 \rightarrow \text{CH}_3\text{COCH}_3 + \text{H}_2\text{O} + \text{OH}$	$5 \times 10^5$ (rel.)	1,7	phot.	Esr; effect of [H <sub>2</sub> O <sub>2</sub> ] on [R] in soln. contg. 2-PrOH and acetone; $2k(\text{R} + \text{R}) = 1.4 \times 10^9$ .	71D227
94.093	$\text{CH}_3\dot{\text{C}}\text{HOC}_2\text{H}_5 + \text{H}_2\text{O}_2$	$(5.5 \pm 1.1) \times 10^4$ (rel.)		chem.	Calcd. from esr in Ti(III)-H <sub>2</sub> O <sub>2</sub> soln. contg. Et <sub>2</sub> O; assumed $2k(\text{R} + \text{R}) = 3 \times 10^9$ .	74D144
94.094	$-\text{O}\dot{\text{C}}\text{H}(\text{CH}_2)_3- + \text{H}_2\text{O}_2$	$3.0 \times 10^4$ (rel.)		chem.	Calcd. from esr in Ti(III)-H <sub>2</sub> O <sub>2</sub> soln. contg. tetrahydrofuran; assumed $2k(\text{R} + \text{R}) = 3 \times 10^9$ .	74D144
94.104	$-\text{O}\dot{\text{C}}\text{HCH}_2\text{O}(\text{CH}_2)_2- + \text{H}_2\text{O}_2$	$(3.0 \pm 0.6) \times 10^4$ (rel.)		chem.	Calcd. from esr in Ti(III)-H <sub>2</sub> O <sub>2</sub> soln. contg. dioxane and <i>tert</i> -BuOH; assumed $2k(\text{R} + \text{R}) = 2 \times 10^9$ .	74D144
94.124	$\cdot\text{CH}(\text{OCH}_3)_2 + \text{H}_2\text{O}_2$	$(1.1 \pm 0.3) \times 10^6$ (rel.)		chem.	Calcd. from esr in Ti(III)-H <sub>2</sub> O <sub>2</sub> soln. contg. dimethoxymethane; assumed $2k(\text{R} + \text{R}) = 2 \times 10^9$ .	74D144
94.125	$-\text{O}\dot{\text{C}}\text{HO}(\text{CH}_2)_2- + \text{H}_2\text{O}_2$	$>6 \times 10^4$ (rel.)		chem.	Calcd. from esr in Ti(III)-H <sub>2</sub> O <sub>2</sub> soln. contg. dioxolane; assumed $2k(\text{R} + \text{R}) = 3 \times 10^9$ .	74D144
94.147	$\cdot\text{CO}_2^- + \text{H}_2\text{O}_2$	$<7 \times 10^5$ (rel.)	7	phot.	Calcd. from assumed chain mechanism in CO-H <sub>2</sub> O <sub>2</sub> soln.; $k < 2.2 \times 10^6$ assuming $2k(\text{R} + \text{R}) < 10^{10}$ , recalcd. in 74D144 assuming $2k(\text{R} + \text{R}) = 3 \times 10^9$ .	63F005



TABLE I. Rate constants for reactions of aliphatic radicals with inorganic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
<b>Pb</b>						
<b>Lead(I) ions</b>						
95.075	$\cdot\text{CH}_2\text{OH} + \text{Pb}^+ \rightarrow \text{PbCH}_2\text{OH}^+$	$2.9 \times 10^9$		p.r.	D.k. at 300 nm (Pb <sup>+</sup> ) in soln. contg. Pb <sup>2+</sup> and MeOH, knowing initial [R] and [Pb <sup>+</sup> ]; cor. for R + R.	76A170
95.076	$\text{CH}_3\dot{\text{C}}\text{HOH} + \text{Pb}^+ \rightarrow \text{PbCHOHCH}_3^+$	$1.7 \times 10^9$		p.r.	D.k. at 300 nm (Pb <sup>+</sup> ) in soln. contg. Pb <sup>2+</sup> and EtOH, knowing initial [R] and [Pb <sup>+</sup> ]; cor. for R + R.	76A170
95.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{Pb}^+ \rightarrow \text{PbC}(\text{CH}_3)_2\text{OH}^+$	$1.1 \times 10^9$		p.r.	D.k. at 300 nm (Pb <sup>+</sup> ) in soln. contg. $5 \times 10^{-4}$ mol L <sup>-1</sup> Pb <sup>2+</sup> and $5 \times 10^{-2}$ mol L <sup>-1</sup> 2-PrOH knowing initial [R] and [Pb <sup>+</sup> ]; cor. for R + R.	76A170
95.096	$\cdot\text{CHOHC}(\text{CH}_2\text{OH})_3 + \text{Pb}^+ \rightarrow \text{PbCHOHC}(\text{CH}_2\text{OH})_3^+$	$7.0 \times 10^8$		p.r.	D.k. at 300 nm (Pb <sup>+</sup> ) in soln. contg. Pb <sup>2+</sup> and pentaerythritol knowing initial [R] and [Pb <sup>+</sup> ]; cor. for R + R.	76A170
<b>Lead(II) ions</b>						
96.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{Pb}^{2+} \rightarrow (\text{CH}_3)_2\text{CO} + \text{Pb}^+ + \text{H}^+$	$3.0 \times 10^4$	5		P.b.k. at 300 nm in 1 mol L <sup>-1</sup> 2-PrOH and 1 mol L <sup>-1</sup> Pb <sup>2+</sup> during 100 $\mu\text{s}$ after pulse; Pb <sup>+</sup> formed initially by $e_{\text{aq}}^- + \text{Pb}^{2+}$ .	76A170
<b>Pt</b>						
<b>trans-Dichlorobis(ethylenediamine)platinum(IV) ion</b>						
97.075	$\cdot\text{CH}_2\text{OH} + \text{Pt}(\text{en})_2\text{Cl}_2^{2+} \rightarrow \text{Pt}(\text{III})$	$(6.9 \pm 1.0) \times 10^8$	7	p.r.	P.b.k. at 240–340 nm in N <sub>2</sub> O-satd. soln. contg. 1–4 mol L <sup>-1</sup> MeOH.	75A188
97.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{Pt}(\text{en})_2\text{Cl}_2^{2+} \rightarrow \text{Pt}(\text{III})$	$(8.1 \pm 1.1) \times 10^8$	7	p.r.	P.b.k. at 260–340 nm in 2 mol L <sup>-1</sup> 2-PrOH soln.; same product as from $e_{\text{aq}}^-$ reaction.	75A188
<b>Rh</b>						
<b>Tris(2,2'-bipyridine)rhodium(III) ion</b>						
98.075	$\cdot\text{CH}_2\text{OH} + \text{Rh}(\text{bpy})_3^{3+}$	$(2.2 \pm 0.2) \times 10^8$	7	p.r.	P.b.k.	74A167
98.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{Rh}(\text{bpy})_3^{3+}$	$(2.9 \pm 0.3) \times 10^9$	7	p.r.	P.b.k.; same product as from $e_{\text{aq}}^-$ .	74A167
98.147	$\cdot\text{CO}_2 + \text{Rh}(\text{bpy})_3^{3+}$	$(6.2 \pm 0.6) \times 10^9$	7	p.r.	P.b.k.; same product as from $e_{\text{aq}}^-$ .	74A167
<b>Tris(1,10-phenanthroline)rhodium(III) ion</b>						
98a.075	$\cdot\text{CH}_2\text{OH} + \text{Rh}(\text{phen})_3^{3+} \rightarrow$ addn. to ligand	$4 \times 10^8$		p.r.	P.b.k. at 475 nm in N <sub>2</sub> O-satd. soln. contg. 2.5 mol L <sup>-1</sup> MeOH.	80A227
98a.076	$\text{CH}_3\dot{\text{C}}\text{HOH} + \text{Rh}(\text{phen})_3^{3+} \rightarrow$ addn. to ligand	$2.5 \times 10^9$		p.r.	P.b.k. at 475 nm in N <sub>2</sub> O-satd. soln. contg. 0.25 mol L <sup>-1</sup> EtOH.	80A227
98a.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{Rh}(\text{phen})_3^{3+} \rightarrow$ Rh(phen) <sub>3</sub> <sup>2+</sup>	$3.2 \times 10^9$	~7	p.r.	P.b.k. at 365 nm in N <sub>2</sub> O-satd. soln. contg. 0.25 mol L <sup>-1</sup> 2-PrOH; same product as with $e_{\text{aq}}^-$ .	80A227
<b>Ru</b>						
<b>Ruthenium(II) ions</b>						
<b>Tris(2,2'-bipyridine)ruthenium(II) ion</b>						
99.016	$\cdot\text{CH}_2\text{C}(\text{CH}_3)_2\text{OH} + \text{Ru}(\text{bpy})_3^{2+}$	$<10^6$	7	p.r.	P.b.k.; no reduction.	78A068
99.075	$\cdot\text{CH}_2\text{O}^- + \text{Ru}(\text{bpy})_3^{2+} \rightarrow \text{Ru}(\text{bpy})_3^+$	$2.9 \times 10^9$	11–13	p.r.	Same product as from $e_{\text{aq}}^-$ reaction; suggested to be [Ru(bpy) <sub>2</sub> (bpy)] <sup>+</sup> [72G381].	78A068
99.076	$\cdot\text{CH}_2\text{OH} + \text{Ru}(\text{bpy})_3^{2+}$	$<10^6$	7	p.r.	No reduction.	78A068
	$\text{CH}_3\dot{\text{C}}\text{HO}^- + \text{Ru}(\text{bpy})_3^{2+}$	$7.0 \times 10^9$	11–13	p.r.	Same product as from $e_{\text{aq}}^-$ reaction.	78A068
	$\text{CH}_3\dot{\text{C}}\text{HOH} + \text{Ru}(\text{bpy})_3^{2+}$	$<10^6$	7	p.r.	No reduction	78A068

TABLE 1. Rate constants for reactions of aliphatic radicals with inorganic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
99.078	$(\text{CH}_3)_2\dot{\text{C}}\text{O}^- + \text{Ru}(\text{bpy})_3^{2+} \rightarrow$ $\text{Ru}(\text{bpy})_3^+$ $(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{Ru}(\text{bpy})_3^{2+}$	$4.9 \times 10^9$ $< 10^6$ $\sim 1.5 \times 10^8$	11–13 7 1	p.r. p.r. p.r.	Same product as from $e_{\text{aq}}^-$ reaction. No reduction Radical addn. to ligand.	78A068 78A068 80A227
99.147	$\cdot\text{CO}_2^- + \text{Ru}(\text{bpy})_3^{2+}$	$< 10^6$	7	p.r.	No reduction.	78A068
99a.	<b>Tris(1,10-phenanthroline)ruthenium(II) ion</b>					
99a.075	$\cdot\text{CH}_2\text{O}^- + \text{Ru}(\text{phen})_3^{2+} \rightarrow$ $\text{Ru}(\text{phen})_3^+$	$5.2 \times 10^9$	11	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. 2.5 mol L <sup>-1</sup> MeOH.	80A227
99a.076	$\text{CH}_3\dot{\text{C}}\text{HO}^- + \text{Ru}(\text{phen})_3^{2+} \rightarrow$ $\text{Ru}(\text{phen})_3^+$	$5.9 \times 10^9$	12	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. 0.25 mol L <sup>-1</sup> EtOH; $k \approx 10^8$ at pH 1.	80A227
99a.078	$(\text{CH}_3)_2\dot{\text{C}}\text{O}^- + \text{Ru}(\text{phen})_3^{2+} \rightarrow$ $\text{Ru}(\text{phen})_3^+$ $(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{Ru}(\text{phen})_3^{2+}$	$3.7 \times 10^9$ $8 \times 10^8$	13 1	p.r. p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. 0.25 mol L <sup>-1</sup> 2-PrOH. P.b.k. in Ar-satd. soln.	80A227 80A227
	<b>Ruthenium(III) ions</b>					
100.	<b>Hexaammineruthenium(III) ion</b>					
100.035	$\cdot\text{CH}_2\text{CO}_2\text{H} + \text{Ru}(\text{NH}_3)_6^{3+}$	$< 3.0 \times 10^7$ $< 5 \times 10^6$	2.5 3.9	p.r. p.r.	D.k. in Ar-satd. 0.01 mol L <sup>-1</sup> acetic acid soln. D.k. in N <sub>2</sub> O-satd. 0.5–1 mol L <sup>-1</sup> acetic acid soln.	72A018 77A100
	$\cdot\text{CH}_2\text{CO}_2^- + \text{Ru}(\text{NH}_3)_6^{3+}$	$< 1 \times 10^7$	7.3	p.r.	D.k. in N <sub>2</sub> O-satd. 0.01 mol L <sup>-1</sup> acetate soln.	72A018
100.042	$\cdot\text{CH}(\text{CO}_2\text{H})_2 + \text{Ru}(\text{NH}_3)_6^{3+}$	$< 1.1 \times 10^8$	2.5	p.r.	D.k. in Ar-satd. 0.01 mol L <sup>-1</sup> malonic acid soln.	72A018
100.054	$\text{HCON}(\text{CH}_3)\dot{\text{C}}\text{H}_2 + \text{Ru}(\text{NH}_3)_6^{3+}$	$< 3.0 \times 10^7$	6.0	p.r.	D.k. in N <sub>2</sub> O-satd. 10 <sup>-2</sup> mol L <sup>-1</sup> dimethylformamide soln.; $e^-$ -transfer.	72A018
100.056	$\text{NH}_2\dot{\text{C}}\text{HCO}_2^- + \text{Ru}(\text{NH}_3)_6^{3+}$	$(4.0 \pm 0.6) \times 10^8$	5.7	p.r.	D.k. in N <sub>2</sub> O-satd. 0.01 mol L <sup>-1</sup> glycine soln.; $e^-$ -transfer.	72A018
100.075	$\cdot\text{CH}_2\text{OH} + \text{Ru}(\text{NH}_3)_6^{3+} \rightarrow$ $\text{CH}_2\text{O} + \text{H}^+ + \text{Ru}(\text{NH}_3)_6^{2+}$	$(4.1 \pm 0.6) \times 10^7$	5–6	p.r.	D.k. in N <sub>2</sub> O-satd. 0.01 mol L <sup>-1</sup> MeOH soln.	72A018
100.076	$\text{CH}_3\dot{\text{C}}\text{HOH} + \text{Ru}(\text{NH}_3)_6^{3+}$	$(5.5 \pm 1.6) \times 10^8$	5–6	p.r.	D.k. in N <sub>2</sub> O-satd. 0.01 mol L <sup>-1</sup> EtOH soln.; $e^-$ -transfer.	72A018
100.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{Ru}(\text{NH}_3)_6^{3+}$	$(9.2 \pm 1.4) \times 10^8$	5–6	p.r.	D.k. in N <sub>2</sub> O-satd. 0.01 mol L <sup>-1</sup> 2-PrOH soln.; $e^-$ -transfer.	72A018
100.093	$\text{CH}_3\dot{\text{C}}\text{HOC}_2\text{H}_5 + \text{Ru}(\text{NH}_3)_6^{3+}$	$(1.0 \pm 0.15) \times 10^8$	3.5–4	p.r.	D.k. in N <sub>2</sub> O-satd. 0.5–1 mol L <sup>-1</sup> ethyl ether soln.	77A100
100.104	$-\text{O}\dot{\text{C}}\text{HCH}_2\text{O}(\text{CH}_2)_2^- + \text{Ru}(\text{NH}_3)_6^{3+}$	$(5.0 \pm 0.75) \times 10^6$	3.5–4	p.r.	D.k. in N <sub>2</sub> O-satd. 0.5–1 mol L <sup>-1</sup> dioxane soln.	77A100
100.107	$\text{CH}_3\text{CO}\dot{\text{C}}(\text{OH})\text{CH}_3 + \text{Ru}(\text{NH}_3)_6^{3+}$	$< 3.8 \times 10^6$ $2.0 \times 10^9$	1.2 5.5	p.r. p.r.	D.k. in Ar-satd. 10 <sup>-3</sup> mol L <sup>-1</sup> biacetyl soln. D.k. in N <sub>2</sub> O-satd. 10 <sup>-2</sup> mol L <sup>-1</sup> biacetyl soln.	72A018 72A018
100.117	$\text{CH}_3\dot{\text{C}}\text{OHCO}_2^- + \text{Ru}(\text{NH}_3)_6^{3+}$	$(2.5 \pm 0.4) \times 10^9$	6.0	p.r.	D.k. in N <sub>2</sub> O-satd. 10 <sup>-3</sup> mol L <sup>-1</sup> lactate ion; $e^-$ -transfer.	72A018
100.127	$\cdot\text{CONH}_2 + \text{Ru}(\text{NH}_3)_6^{3+}$	$< 7.0 \times 10^7$	6.2	p.r.	D.k. in N <sub>2</sub> O-satd. 10 <sup>-2</sup> mol L <sup>-1</sup> formamide soln.; $e^-$ -transfer.	72A018
100.147	$\cdot\text{CO}_2^- + \text{Ru}(\text{NH}_3)_6^{3+} \rightarrow$ $\text{CO}_2 + \text{Ru}(\text{NH}_3)_6^{2+}$	$(2.0 \pm 0.6) \times 10^9$	4.8	p.r.	D.k. in N <sub>2</sub> O-satd. 10 <sup>-2</sup> mol L <sup>-1</sup> formate soln.; $e^-$ -transfer.	72A018
101.	<b>Bromopentaammineruthenium(III) ion</b>					
101.035	$\cdot\text{CH}_2\text{CO}_2\text{H} + \text{Ru}(\text{NH}_3)_5\text{Br}^{2+}$	$(4.6 \pm 0.7) \times 10^8$	3.9	p.r.	D.k. in N <sub>2</sub> O-satd. 0.5–1 mol L <sup>-1</sup> acetic acid.	77A100
101.093	$\text{CH}_3\dot{\text{C}}\text{HOC}_2\text{H}_5 + \text{Ru}(\text{NH}_3)_5\text{Br}^{2+}$	$(5.8 \pm 0.9) \times 10^8$	3.5–4	p.r.	D.k. in N <sub>2</sub> O-satd. 0.5–1 mol L <sup>-1</sup> ethyl ether soln.	77A100
101.104	$-\text{O}\dot{\text{C}}\text{HCH}_2\text{O}(\text{CH}_2)_2^- + \text{Ru}(\text{NH}_3)_5\text{Br}^{2+}$	$(2.7 \pm 0.4) \times 10^8$	3.5–4	p.r.	D.k. in N <sub>2</sub> O-satd. 0.5–1 mol L <sup>-1</sup> dioxane soln.	77A100
102.	<b>Chloropentaammineruthenium(III) ion</b>					
102.035	$\cdot\text{CH}_2\text{CO}_2\text{H} + \text{Ru}(\text{NH}_3)_5\text{Cl}^{2+}$	$(4.0 \pm 0.6) \times 10^7$	3.9	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. 0.5–1 mol L <sup>-1</sup> acetic acid.	77A100
102.075	$\cdot\text{CH}_2\text{OH} + \text{Ru}(\text{NH}_3)_5\text{Cl}^{2+}$	$(1.2 \pm 0.2) \times 10^8$	3.4–5	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. 0.5–1 mol L <sup>-1</sup> methanol.	77A100

TABLE I. Rate constants for reactions of aliphatic radicals with inorganic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
102.076	$\text{CH}_3\dot{\text{C}}\text{HOH} + \text{Ru}(\text{NH}_3)_5\text{Cl}^{2+}$	$(8.0 \pm 1.2) \times 10^8$	3.5–4	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. 0.5–1 mol L <sup>-1</sup> ethanol.	77A100
102.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{Ru}(\text{NH}_3)_5\text{Cl}^{2+}$	$(1.3 \pm 0.2) \times 10^9$	3.5–4	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. 0.5–1 mol L <sup>-1</sup> 2-propanol.	77A100
102.093	$\text{CH}_3\dot{\text{C}}\text{HOC}_2\text{H}_5 + \text{Ru}(\text{NH}_3)_5\text{Cl}^{2+}$	$(2.6 \pm 0.4) \times 10^8$	3.5–4	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. 0.5–1 mol L <sup>-1</sup> ethyl ether.	77A100
102.104	$-\dot{\text{O}}\dot{\text{C}}\text{HCH}_2\text{O}(\text{CH}_2)_2- + \text{Ru}(\text{NH}_3)_5\text{Cl}^{2+}$	$(8.3 \pm 1.2) \times 10^7$	3.5–4	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. 0.5–1 mol L <sup>-1</sup> dioxane.	77A100
103.	<b>Nitropentaammineruthenium(III) ion</b>					
103.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{Ru}(\text{NH}_3)_5\text{NO}^{3+} \rightarrow \text{Ru}(\text{NH}_3)_5\text{NO}^{2+} + (\text{CH}_3)_2\text{CO} + \text{H}^+$	$5.5 \times 10^8$	5.0	p.r.	P.b.k. at 280 nm in N <sub>2</sub> O-satd. soln. contg. 0.5 mol L <sup>-1</sup> 2-PrOH.	75A049
103.147	$\cdot\text{CO}_2^- + \text{Ru}(\text{NH}_3)_5\text{NO}^{3+} \rightarrow \text{Ru}(\text{NH}_3)_5\text{NO}^{2+} + \text{CO}_2$	$3.1 \times 10^9$	6.6	p.r.	P.b.k. at 280 nm in N <sub>2</sub> O-satd. soln. contg. 0.5 mol L <sup>-1</sup> formate ion.	75A049
104.	<b>Nitropentaammineruthenium(III) radical ion (electron adduct)</b>					
104.006	$\cdot\text{CH}_2\text{C}(\text{CH}_3)_2\text{CO}_2^- + \text{Ru}(\text{NH}_3)_5\dot{\text{N}}\text{O}^{2+} \rightarrow [\text{Ru}(\text{NH}_3)_5\text{N}(\text{O})\text{CH}_2\text{C}(\text{CH}_3)_2\text{CO}_2]^{2+}$	$(2.9 \pm 0.4) \times 10^9$	6.0–7.5	p.r.	D.k. at 280 nm (nitrosyl radical, $\epsilon = 3.8 \times 10^3$ L mol <sup>-1</sup> cm <sup>-1</sup> ), as well as p.b.k. in soln. contg. 0.3 mol L <sup>-1</sup> pivalate ion and $5 \times 10^{-4}$ mol L <sup>-1</sup> Ru(NH <sub>3</sub> ) <sub>5</sub> NO <sup>3+</sup> .	79A134
104.012	$\cdot\text{CH}_2\text{C}(\text{CH}_3)_2\text{NH}_3^+ + \text{Ru}(\text{NH}_3)_5\dot{\text{N}}\text{O}^{2+} \rightarrow [\text{Ru}(\text{NH}_3)_5\text{N}(\text{O})\text{CH}_2\text{C}(\text{CH}_3)_2\text{NH}_3]^{3+}$	$(2.0 \pm 0.3) \times 10^9$	6.0–7.5	p.r.	D.k. at 280 nm (nitrosyl radical, $\epsilon = 3.8 \times 10^3$ L mol <sup>-1</sup> cm <sup>-1</sup> ), as well as p.b.k. in soln. contg. 0.3 mol L <sup>-1</sup> <i>tert</i> -BuNH <sub>2</sub> and $5 \times 10^{-4}$ mol L <sup>-1</sup> Ru(NH <sub>3</sub> ) <sub>5</sub> NO <sup>3+</sup> .	79A134
104.013	$\cdot\text{CH}_2\text{C}(\text{CH}_3)(\text{NH}_3^+)\text{CO}_2^- + \text{Ru}(\text{NH}_3)_5\dot{\text{N}}\text{O}^{2+} \rightarrow [\text{Ru}(\text{NH}_3)_5\text{N}(\text{O})\text{CH}_2\text{C}(\text{CH}_3)(\text{NH}_3)\text{CO}_2]^{2+}$	$(3.1 \pm 0.5) \times 10^9$	6.0–7.5	p.r.	D.k. at 280 nm (nitrosyl radical, $\epsilon = 3.8 \times 10^3$ L mol <sup>-1</sup> cm <sup>-1</sup> ), as well as p.b.k. in soln. contg. 0.3 mol L <sup>-1</sup> 2-aminoisobutyrate ion and $5 \times 10^{-4}$ mol L <sup>-1</sup> Ru(NH <sub>3</sub> ) <sub>5</sub> NO <sup>3+</sup> .	79A134
104.016	$\cdot\text{CH}_2\text{C}(\text{CH}_3)_2\text{OH} + \text{Ru}(\text{NH}_3)_5\dot{\text{N}}\text{O}^{2+} \rightarrow [\text{Ru}(\text{NH}_3)_5\text{N}(\text{O})\text{CH}_2\text{C}(\text{CH}_3)_2\text{OH}]^{2+}$	$(3.7 \pm 0.6) \times 10^9$	6.0–7.5	p.r.	D.k. at 280 nm (nitrosyl radical, $\epsilon = 3.8 \times 10^3$ L mol <sup>-1</sup> cm <sup>-1</sup> ), as well as p.b.k. in soln. contg. 0.3 mol L <sup>-1</sup> <i>tert</i> -BuOH and $5 \times 10^{-4}$ mol L <sup>-1</sup> Ru(NH <sub>3</sub> ) <sub>5</sub> NO <sup>3+</sup> .	79A134
104.017	$\cdot\text{CH}_2\text{C}(\text{CH}_3)(\text{OH})\text{CO}_2^- + \text{Ru}(\text{NH}_3)_5\dot{\text{N}}\text{O}^{2+} \rightarrow [\text{Ru}(\text{NH}_3)_5\text{N}(\text{O})\text{CH}_2\text{C}(\text{CH}_3)(\text{OH})\text{CO}_2]^{2+}$	$(3.0 \pm 0.4) \times 10^9$	6.0–7.5	p.r.	D.k. at 280 nm (nitrosyl radical, $\epsilon = 3.8 \times 10^3$ L mol <sup>-1</sup> cm <sup>-1</sup> ) as well as p.b.k. in soln. contg. 0.3 mol L <sup>-1</sup> 2-hydroxyisobutyrate ion and $4 \times 10^{-4}$ mol L <sup>-1</sup> Ru(NH <sub>3</sub> ) <sub>5</sub> NO <sup>3+</sup> .	79A134
104.055	$\text{CH}_3\text{CON}(\text{CH}_3)\dot{\text{C}}\text{H}_2 + \text{Ru}(\text{NH}_3)_5\dot{\text{N}}\text{O}^{2+} \rightarrow [\text{Ru}(\text{NH}_3)_5\text{N}(\text{O})\text{CH}_2\text{N}(\text{CH}_3)\text{C}(\text{O})\text{CH}_3]^{2+}$	$(2.9 \pm 0.4) \times 10^9$	6.0–7.5	p.r.	D.k. at 280 nm (nitrosyl radical, $\epsilon = 3.8 \times 10^3$ L mol <sup>-1</sup> cm <sup>-1</sup> ), as well as p.b.k. in soln. contg. 0.3 mol L <sup>-1</sup> <i>N,N</i> -dimethylacetamide and $5 \times 10^{-4}$ mol L <sup>-1</sup> Ru(NH <sub>3</sub> ) <sub>5</sub> NO <sup>3+</sup> .	79A134
105.	<b>Tris(2,2'-bipyridine)ruthenium(III) ion</b>					
105.016	$\cdot\text{CH}_2\text{C}(\text{CH}_3)_2\text{OH} + \text{Ru}(\text{bpy})_3^{3+} \rightarrow \text{Ru}(\text{bpy})_3^{2+}$	$1.3 \times 10^9$ $(1.9 \pm 0.2) \times 10^8$	acid 4.6	p.r. p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. <i>tert</i> -BuOH.	72G462 78A070
	<b>Sulfur compounds</b>					
106.	<b>Hydrogen sulfide</b>					
106.016	$\cdot\text{CH}_2\text{C}(\text{CH}_3)_2\text{OH} + \text{H}_2\text{S} \rightleftharpoons \text{H}_2\dot{\text{S}}\text{CH}_2\text{C}(\text{CH}_3)_2\text{OH} \rightarrow (\text{CH}_3)_2\dot{\text{C}}\text{OH} + \cdot\text{SH}$		6	p.r.	Effect of [H <sub>2</sub> S] on p.b.k. at 380 nm (complex) gave $K = 1 \times 10^{-3}$ mol L <sup>-1</sup> ; $k(\text{complex} \rightarrow \text{tert-BuOH} + \cdot\text{SH}) = 1.3 \times 10^5$ s <sup>-1</sup> .	67G262
106.075	$\cdot\text{CH}_2\text{OH} + \text{H}_2\text{S} \rightleftharpoons \text{H}_2\dot{\text{S}}\text{CH}_2\text{OH} \rightarrow \text{CH}_3\text{OH} + \cdot\text{SH}$		6	p.r.	Effect of [H <sub>2</sub> S] on p.b.k. at 360 nm (complex) gave $K = 5.3 \times 10^{-4}$ mol L <sup>-1</sup> ; $k(\text{complex} \rightarrow \text{MeOH} + \cdot\text{SH}) = 2.3 \times 10^5$ s <sup>-1</sup> .	67G262

TABLE 1. Rate constants for reactions of aliphatic radicals with inorganic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
106.076	$\text{CH}_3\dot{\text{C}}\text{HOH} + \text{H}_2\text{S} \rightleftharpoons \text{H}_2\dot{\text{S}}\text{CHOHCH}_3$ $\rightarrow \text{CH}_3\text{CH}_2\text{OH} + \cdot\text{SH}$		6	p.r.	Effect of [H <sub>2</sub> S] on p.b.k. at 380 nm (complex) gave $K = 6.4 \times 10^{-4}$ mol L <sup>-1</sup> ; $k(\text{complex} \rightarrow \text{EtOH} + \cdot\text{SH}) = 4.6 \times 10^5 \text{ s}^{-1}$ .	67G262
106.077	$\text{CH}_3\text{CH}_2\dot{\text{C}}\text{HOH} + \text{H}_2\text{S} \rightleftharpoons$ $\text{H}_2\dot{\text{S}}\text{CHOHCH}_2\text{CH}_3$ $\rightarrow \text{CH}_3\text{CH}_2\text{CH}_2\text{OH} + \cdot\text{SH}$		6	p.r.	Effect of [H <sub>2</sub> S] on p.b.k. at 380 nm (complex) gave $K = 5.7 \times 10^{-4}$ mol L <sup>-1</sup> ; $k(\text{complex} \rightarrow 1\text{-PrOH} + \cdot\text{SH}) = 3.8 \times 10^5 \text{ s}^{-1}$ .	67G262
106.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{H}_2\text{S} \rightleftharpoons$ $\text{H}_2\dot{\text{S}}\text{COH}(\text{CH}_3)_2 \rightarrow$ $(\text{CH}_3)_2\text{CHOH} + \cdot\text{SH}$		6	p.r.	Effect of [H <sub>2</sub> S] on p.b.k. at 380 nm (complex) gave $K = 1.1 \times 10^{-3}$ mol L <sup>-1</sup> ; $k(\text{complex} \rightarrow 2\text{-PrOH} + \cdot\text{SH}) = 8.6 \times 10^5 \text{ s}^{-1}$ .	67G262
107.	<b>Sulfur dioxide</b>					
107.147	$\cdot\text{CO}_2^- + \text{SO}_2 \rightarrow \text{SO}_2^- + \text{CO}_2$	$(7.6 \pm 1) \times 10^8$	3.1	p.r.	P.b.k. at 320 nm in soln. contg. 1 mol L <sup>-1</sup> formate; $2k(\text{R} + \text{R}) = 7.6 \times 10^9$ .	75A118
108.	<b>Tetrathionate ion</b>					
108.147	$\cdot\text{CO}_2^- + \text{S}_4\text{O}_6^{2-} \rightarrow \text{CO}_2 + \text{S}_4\text{O}_6^{3-}$	$5.8 \times 10^7$		p.r.	P.b.k. at 370 nm in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> formate, as well as d.k. at 280 nm.	73A027
	<b>Sc</b>					
109.	<b>Scandium(III) ions</b>					
109.147	$\cdot\text{CO}_2^-(\text{CO}_2\text{H}) + \text{Sc(III)}$		1.4	p.r.	No reaction in 1 mol L <sup>-1</sup> formic acid and $1 \times 10^{-2}$ mol L <sup>-1</sup> Sc(III).	73A057
	<b>Ti</b>					
110.	<b>Titanium(III) ions</b>					
110.035	$\cdot\text{CH}_2\text{CO}_2\text{H} + \text{Ti}^{3+} \rightarrow \text{Ti}^{3+}\text{-CH}_2\text{CO}_2\text{H}$ $\rightarrow \text{Ti(IV)}$	$(4 \pm 1) \times 10^6$	0.5	p.r.	Complex formn. deduced from transient spectra.	79A341
110.042	$\cdot\text{CH}(\text{CO}_2\text{H})_2 + \text{Ti(III)} \rightarrow \text{Ti(IV)}$	$8 \times 10^6$	~0	e-r.	Calcd. from effect of [Ti <sup>III</sup> ] on on esr signal intensity; $2k(\text{R} + \text{R}) \approx 10^9$ .	73G249
110.075	$\cdot\text{CH}_2\text{OH} + \text{Ti(III)}$			p.r.	No reaction in soln. contg. 1 mol L <sup>-1</sup> MeOH and $10^{-2}$ mol L <sup>-1</sup> Ti(III).	73A057
110.147	$\cdot\text{CO}_2^- + \text{Ti(III)} \rightarrow \text{Ti(II)}$	$\sim 5 \times 10^6$	1.4	p.r.	D.k. in 1 mol L <sup>-1</sup> formic acid soln.; $\text{p}K_a(\text{CO}_2\text{H}) = 1.4$ .	73A057
	$\cdot\text{CO}_2\text{H}(\text{CO}_2^-) + \text{Ti}^{3+} \rightarrow \text{Ti}^{3+}\text{-CO}_2\text{H}$ $\rightarrow \text{Ti(II)}$	$(4 \pm 1) \times 10^6$	0.5	p.r.	Complex formn. deduced from transient spectra.	79A341
	<b>Tl</b>					
111.	<b>Thallium(I) ion</b>					
111.076	$\text{CH}_3\dot{\text{C}}\text{HO}^- + \text{Ti}^+ \rightarrow \text{Ti}_2^+$	$1.5 \times 10^9$	13	p.r.	P.b.k. at 420 nm in soln. contg. 0.1 mol L <sup>-1</sup> EtOH and $2 \times 10^{-4}$ mol L <sup>-1</sup> Ti <sup>+</sup> ; no reaction in neutral or acid soln.	80A123
111.078	$(\text{CH}_3)_2\dot{\text{C}}\text{O}^- + \text{Ti}^+ \rightarrow \text{Ti}_2^+$	$3.0 \times 10^9$	13	p.r.	P.b.k. at 420 nm in soln. contg. 0.1 mol L <sup>-1</sup> 2-PrOH and $1 \times 10^{-4}$ mol L <sup>-1</sup> Ti <sup>+</sup> ; no reaction in neutral or acid soln. See also 79G191.	80A123
111.147	$\cdot\text{CO}_2^- + \text{Ti}^+ \rightarrow \text{Ti}_2^+$	$2.3 \times 10^6$	13	p.r.	P.b.k. at 420 nm in soln. contg. 1 mol L <sup>-1</sup> formate and $1.5 \times 10^{-2}$ mol L <sup>-1</sup> Ti <sup>+</sup> ; reaction also obs. for neutral and acid soln.	80A123

TABLE 1. Rate constants for reactions of aliphatic radicals with inorganic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
<b>111a. Thallium(I) ion, complex with Tl(0)</b>						
111a.075	$\cdot\text{CH}_2\text{OH} + \text{Tl}_2^+ + \text{H}^+ \rightarrow \text{CH}_3\text{OH} + 2 \text{Tl}^+$	$4.0 \times 10^9$	6	p.r.	Calcd. from d.k. at 420 nm. and condy. change in soln. contg. alcohol and $\text{Tl}^+$ assuming values for $2k(\text{Tl}_2^+ + \text{Tl}_2^+)$ , $k(\text{Tl}_2^+ + \text{H}_2\text{O}_2)$ and $2k(\text{R} + \text{R})$ .	80A123
111a.076	$\text{CH}_3\dot{\text{C}}\text{HOH} + \text{Tl}_2^+ + \text{H}^+ \rightarrow \text{CH}_3\text{CH}_2\text{OH} + 2 \text{Tl}^+$	$3.0 \times 10^9$	6	p.r.	See above.	80A123
111a.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{Tl}_2^+ + \text{H}^+ \rightarrow (\text{CH}_3)_2\text{CHOH} + 2 \text{Tl}^+$	$3.0 \times 10^9$	6	p.r.	See above.	80A123
<b>Yb</b>						
<b>112. Ytterbium(III) ions</b>						
112.147	$\cdot\text{CO}_2^-(\cdot\text{CO}_2\text{H}) + \text{Yb(III)}$		1.4	p.r.	No reaction in soln. contg. 1 mol L <sup>-1</sup> formic acid and 10 <sup>-2</sup> mol L <sup>-1</sup> Yb(III).	73A057
<b>Zn</b>						
<b>113. Zinc(I) ion</b>						
113.016	$\cdot\text{CH}_2\text{C}(\text{CH}_3)_2\text{OH} + \text{Zn}^+ (+ \text{H}^+) \rightarrow \text{Zn}^{2+} + (\text{CH}_3)_3\text{COH}$	$(1.0 \pm 0.3) \times 10^9$	7	p.r.	Calcd. from d.k. at 310 nm ( $\text{Zn}^+$ ) in <i>tert</i> -BuOH-ZnSO <sub>4</sub> soln. assuming $k(\text{H} + \text{H}) = 1.3 \times 10^{10}$ , $k(\text{Zn}^+ + \text{Zn}^+) = 4 \times 10^8$ , $k(\text{R} + \text{R}) = 6.5 \times 10^8$ and $k(\text{Zn}^+ + \text{H}) = 2.8 \times 10^9$ .	77A011
113.075	$\cdot\text{CH}_2\text{OH} + \text{Zn}^+ (+ \text{H}^+) \rightarrow \text{Zn}^{2+} + \text{CH}_3\text{OH}$	$(2.5 \pm 0.3) \times 10^9$	7	p.r.	Calcd. from d.k. at 310 nm ( $\text{Zn}^+$ ) in N <sub>2</sub> O-MeOH-ZnSO <sub>4</sub> soln. taking $k(\text{Zn}^+ + \text{Zn}^+) = 4.5 \times 10^8$ , $k(\text{Zn}^+ + \text{H}_2\text{O}_2) = 2.4 \times 10^9$ , $k(\text{Zn}^+ + \text{N}_2\text{O}) = 1.6 \times 10^7$ and $k(\text{R} + \text{R}) = 1.5 \times 10^9$ .	77A011
113.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{Zn}^+ (+ \text{H}^+) \rightarrow \text{Zn}^{2+} + (\text{CH}_3)_2\text{CHOH}$	$(1.3 \pm 0.25) \times 10^9$	~3,7	p.r.	Calcd. from d.k. at 310 nm ( $\text{Zn}^+$ ) in 2-PrOH-ZnSO <sub>4</sub> soln. taking $k(\text{Zn}^+ + \text{Zn}^+) = 4.5 \times 10^8$ .	77A011
113.147	$\cdot\text{CO}_2^- + \text{Zn}^+ (+ \text{H}^+) \rightarrow \text{Zn}^{2+} + \text{HCO}_2^-$	~ $4 \times 10^9$		p.r.	Est. from first-order decay at 310 nm ( $\text{Zn}^+$ ) in formate-ZnSO <sub>4</sub> soln.	77A011
<b>114. Zinc(II) ion</b>						
114.016	$\cdot\text{CH}_2\text{C}(\text{CH}_3)_2\text{OH} + \text{Zn}^{2+}$	<10 <sup>6</sup>		p.r.	Est. from lack of increase in $\text{Zn}^+$ in 0.1 mol L <sup>-1</sup> $\text{Zn}^{2+}$ soln. upon addn. of 0.1 mol L <sup>-1</sup> <i>tert</i> -BuOH.	75A027
114.075	$\cdot\text{CH}_2\text{OH} + \text{Zn}^{2+}$	<10 <sup>2</sup>		p.r.	Est. from lack of increase in $\text{Zn}^+$ in 0.1 mol L <sup>-1</sup> $\text{Zn}^{2+}$ soln. upon addn. of 0.1 mol L <sup>-1</sup> MeOH.	75A027
114.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{Zn}^{2+}$	<10 <sup>6</sup>		p.r.	Est. from lack of increase in $\text{Zn}^+$ in 2-PrOH.	75A027
114.147	$\cdot\text{CO}_2^- + \text{Zn}^{2+}$	<10 <sup>2</sup>		p.r.	Est. from lack of increase in $\text{Zn}^+$ in 0.1 mol L <sup>-1</sup> $\text{Zn}^{2+}$ soln. upon addn. of 0.1 mol L <sup>-1</sup> formate ion.	75A027
		<2 x 10 <sup>4</sup>		p.r.	No reaction in 0.5 mol L <sup>-1</sup> ZnSO <sub>4</sub> .	77A011
<i>Zinc hematoporphyrin See 221.</i>						
<i>Zinc(II)-Insulin See 233a.</i>						

TABLE 2. Rate constants for reactions of aliphatic radicals with organic solutes in aqueous solution

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
115.	<b>Acetic acid</b>					
115.001	$\cdot\text{CH}_3 + \text{CH}_3\text{CO}_2\text{H} \rightarrow$ $\text{CH}_4 + \cdot\text{CH}_2\text{CO}_2\text{H}$	$2 \times 10^2$	~1	chem.	Radical from dimethyl sulfoxide in Ti <sup>III</sup> -H <sub>2</sub> O <sub>2</sub> soln.; est. from esr meas. and values for competing reactions.	75D188
116.	<b>Acetone</b>					
116.001	$\cdot\text{CH}_3 + \text{CH}_3\text{COCH}_3 \rightarrow$ $\text{CH}_4 + \cdot\text{CH}_2\text{COCH}_3$	$0.99[k(\text{R} + \text{R})]^{0.5}$ $1.00[k(\text{R} + \text{R})]^{0.5}$	nat nat	phot. phot.	Est. from quantum yields of CH <sub>4</sub> , CO, and C <sub>2</sub> H <sub>6</sub> . Obs. yields of CH <sub>4</sub> and C <sub>2</sub> H <sub>6</sub> ; $\log k$ (in cm <sup>3</sup> mol <sup>-1</sup> s <sup>-1</sup> ) = [(4.47 ± 0.05) - (1335 ± 18)/T] - 0.5 log $k(\text{R} + \text{R})$ .	60F004 69F176
117.	<b>Acetonitrile</b>					
117.001	$\cdot\text{CH}_3 + \text{CH}_3\text{CN} \rightarrow$ $\text{CH}_4 + \cdot\text{CH}_2\text{CN}$	$< 3 \times 10^2$	~1	chem.	Radical from dimethyl sulfoxide in Ti <sup>III</sup> -H <sub>2</sub> O <sub>2</sub> soln.; est. from esr.	75D188
118.	<b>Acetophenone</b>					
118.076	$\text{CH}_3\dot{\text{C}}\text{HO}^- + \text{C}_6\text{H}_5\text{COCH}_3 \rightarrow$ $\text{CH}_3\text{CHO} + (\text{C}_6\text{H}_5\text{COCH}_3)^{\cdot-}$	$1.1 \times 10^9$	13	p.r.	P.b.k. at 440 nm in N <sub>2</sub> O-satd. soln. contg. 1 mol L <sup>-1</sup> EtOH; pH dependent, $k$ extrapolated to pH 14.	73G122
118.078	$(\text{CH}_3)_2\dot{\text{C}}\text{O}^- + \text{C}_6\text{H}_5\text{COCH}_3 \rightarrow$ $\text{CH}_3\text{COCH}_3 + (\text{C}_6\text{H}_5\text{COCH}_3)^{\cdot-}$	$7.8 \times 10^8$ $9 \times 10^8$	13 13	p.r. p.r.	P.b.k. at 440 nm in acetone soln. P.b.k. at 440 nm in N <sub>2</sub> O-satd. soln. contg. 1 mol L <sup>-1</sup> 2-PrOH; pH dependent, $k$ extrapolated to pH 14.	67G729 73G122
118.142	$\text{R} + \text{C}_6\text{H}_5\text{COCH}_3 \rightarrow (\text{C}_6\text{H}_5\text{COCH}_3)^{\cdot-}$ (R = Electron adduct of glycine anhydride)	$(2.3 \pm 0.3) \times 10^9$ $(2.0 \pm 0.3) \times 10^9$	5.2 12.3	p.r.	P.b.k. at 280 nm (320 at pH 12.3) in soln. contg. 1 mol L <sup>-1</sup> <i>tert</i> -BuOH.	71G554
118.143	$\text{R} + \text{C}_6\text{H}_5\text{COCH}_3 \rightarrow (\text{C}_6\text{H}_5\text{COCH}_3)^{\cdot-}$ (R = Electron adduct of alanine anhydride)	$(2.0 \pm 0.3) \times 10^9$ $(1.5 \pm 0.4) \times 10^9$	5.2 12.2	p.r.	P.b.k. at 280 nm (320 at pH 12.2) in soln. contg. 1 mol L <sup>-1</sup> <i>tert</i> -BuOH.	71G554
118.144	$\text{R} + \text{C}_6\text{H}_5\text{COCH}_3 \rightarrow (\text{C}_6\text{H}_5\text{COCH}_3)^{\cdot-}$ (R = Electron adduct of sarcosine anhydride)	$(2.0 \pm 0.2) \times 10^9$ $(2.1 \pm 0.2) \times 10^9$	5.2 12.4	p.r.	P.b.k. at 280 nm (320 at pH 12.4) in soln. contg. 1 mol L <sup>-1</sup> <i>tert</i> -BuOH.	71G554
118.147	$\cdot\text{CO}_2^- + \text{C}_6\text{H}_5\text{COCH}_3 \rightarrow$ $\text{CO}_2 + (\text{C}_6\text{H}_5\text{COCH}_3)^{\cdot-}$	$1 \times 10^7$	12	p.r.	P.b.k. at 440 nm.	68G308
119.	<b>Acetylene</b>					
119.022	$\cdot\text{CH}=\text{CHOH} + \text{CH}=\text{CH}$	$(8.8 \pm 0.9) \times 10^6$	4.0, 6.0	p.r.	Radical from OH + C <sub>2</sub> H <sub>2</sub> ; p.b.k. at 290 nm; $E_a = 25.1$ kJ mol <sup>-1</sup> ; product thought to be hydroxybutadienyl which reacts to give hydroxyhexatrienyl (p.b.k. at 260 nm, $k = 5 \times 10^6$ L mol <sup>-1</sup> s <sup>-1</sup> ).	78A007
120.	<b>3-Acetylpyridine</b>					
120.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{CH}_3\text{COC}_5\text{H}_4\text{NH}^+ \rightarrow$ $e^-$ -transfer	$(8.6 \pm 1.7) \times 10^9$	0.6	p.r.	P.b.k.; no $e^-$ -transfer in neutral soln.; $pK_a = 4.9$ .	74A089
121.	<b>Acridine</b>					
121.075	$\cdot\text{CH}_2\text{OH} + \text{C}_{13}\text{H}_9\text{NH}^+$	$5.0 \times 10^8$	2.0	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. MeOH; ~30% $e^-$ -transfer; no reaction at pH 7.6; $pK_a = 5.6$ .	74A127
121.078	$(\text{CH}_3)_2\dot{\text{C}}\text{O}^- + \text{C}_{13}\text{H}_9\text{N} \rightarrow$ $(\text{CH}_3)_2\text{CO} + \cdot\text{A}^-$	$3 \times 10^9$	13	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. 2-PrOH.	79A305
	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{C}_{13}\text{H}_9\text{N} \rightarrow$ $\cdot\text{AR} + \cdot\text{A}$ (50% redn., 50% addn.)	$3.0 \times 10^8$ $\sim 3 \times 10^8$	7.6 7-9	p.r. p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. 2-PrOH; ~40% $e^-$ -transfer. P.b.k.	74A127 79A305
	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{C}_{13}\text{H}_9\text{NH}^+ \rightarrow$ $(\text{CH}_3)_2\text{CO} + \text{H}^+ + \cdot\text{AH}$	$3.7 \times 10^9$ $3.3 \times 10^9$	2.0 4	p.r. p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. 2-PrOH; ~90% $e^-$ -transfer. P.b.k.	74A127 79A305

TABLE 2. Rate constants for reactions of aliphatic radicals with organic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
121.147	$\cdot\text{CO}_2^- + \text{AH}^+ \rightarrow \cdot\text{AH}$	$\sim 3 \times 10^8$	7	p.r.	P.b.k.; at pH 13 adduct is formed ( $\cdot\text{CO}_2^- + \text{A} \rightarrow \cdot\text{ACO}_2^-$ ).	79A305
122.	<b>Acriflavin (3,10-Diamino-10-methylacridinium chloride)</b>					
122.147	$\cdot\text{CO}_2^- + \text{A}$	$(3.7 \pm 0.4) \times 10^8$		p.r.	D.k. (dye) in Ar-satd. 0.1 mol L <sup>-1</sup> formate; same product as concurrent fast reaction with $e_{\text{aq}}^-$ .	70G241
123.	<b>Acrylamide</b>					
123.016	$\cdot\text{CH}_2\text{C}(\text{CH}_3)_2\text{OH} + \text{CH}_2=\text{CHCONH}_2 \rightarrow$ $\text{HOC}(\text{CH}_3)_2\text{CH}_2\text{CH}_2\text{CHCONH}_2$	$(4.5 \pm 1.4) \times 10^7$ $(6.8 \pm 2) \times 10^7$ (rel.)	4.5 3	p.r.	C.k. in N <sub>2</sub> O-satd. soln. contg. <i>tert</i> -BuOH and Cu <sup>2+</sup> ; rel. to $k(\text{R} + \text{Cu}^{2+}) = 2.7 \times 10^6$ at pH 4.5 and $3.2 \times 10^6$ at pH 3.	78A322
123.075	$\cdot\text{CH}_2\text{OH} + \text{CH}_2=\text{CHCONH}_2 \rightarrow$ $\text{HOCH}_2\text{CH}_2\text{CHCONH}_2$	$(2.6 \pm 0.8) \times 10^7$ (rel.)	2-5	p.r.	C.k. in N <sub>2</sub> O-satd. soln. contg. MeOH and Cu <sup>2+</sup> ; rel. to $k(\text{R} + \text{Cu}^{2+}) = 1.6 \times 10^8$ .	78A322
123.076	$\text{CH}_3\dot{\text{C}}\text{HOH} + \text{CH}_2=\text{CHCONH}_2 \rightarrow$ $\text{CH}_3\text{CHOHCH}_2\text{CHCONH}_2$	$(2.6 \pm 0.8) \times 10^7$ (rel.)	2-5	p.r.	C.k. in N <sub>2</sub> O-satd. soln. contg. EtOH and Cu <sup>2+</sup> ; rel. to $k(\text{R} + \text{Cu}^{2+}) = 9.4 \times 10^7$ .	78A322
123.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{CH}_2=\text{CHCONH}_2 \rightarrow$ $(\text{CH}_3)_2\text{C}(\text{OH})\text{CH}_2\text{CHCONH}_2$	$(4.1 \pm 1.2) \times 10^7$ (rel.)	2-5	p.r.	C.k. in N <sub>2</sub> O-satd. soln. contg. 2-PrOH and Cu <sup>2+</sup> ; rel. to $k(\text{R} + \text{Cu}^{2+}) = 5.2 \times 10^7$ .	78A322
123.128	$[\text{CH}_2\text{CHCONH}_2]^- + \text{CH}_2=\text{CHCONH}_2 \rightarrow$ $\text{HOC}(\text{NH}_2)=\text{CH}(\text{CH}_2)_2\text{CHCONH}_2$	$(2.5 \pm 0.4) \times 10^5$	$\sim 6$	p.r.	D.k. at 275 nm.	70G052
123.147	$\cdot\text{CO}_2^- + \text{CH}_2=\text{CHCONH}_2 \rightarrow$ addn.	$\sim (4 \pm 1) \times 10^7$	$\sim 5$	p.r.	Electron transfer not obs.	70G052
124.	<b>Adenosine</b>					
124.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{A} \rightarrow$ <i>e</i> -transfer $(\text{CH}_3)_2\dot{\text{C}}\text{O}^- + \text{A}$	$4.7 \times 10^7$ $< 10^6$ $< 10^6$	2.2 7.0 13.6	p.r.	P.b.k.	75A060
125.	<b>Adenosine monophosphate</b>					
125.147	$\cdot\text{CO}_2^- + \text{A}$	$< 10^6$	8.3	p.r.	P.b.k. at 550 nm (A <sup>-</sup> ) in N <sub>2</sub> O-satd. 0.1 mol L <sup>-1</sup> formate.	68G441
126.	<b>Alloxan</b>					
126.147	$\cdot\text{CO}_2^- + \text{A} (+ \text{H}^+) \rightarrow$ $\text{CO}_2 + \cdot\text{AH}$	$(3.7 \pm 1.1) \times 10^7$	4.8	p.r.	P.b.k. at 310 nm in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> formate; cor. for decay of $\cdot\text{CO}_2^-$ .	79A327 80A197
127.	<b>2-Amino-5-nitrothiazole</b>					
127.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{NX} \rightarrow$ $(\text{CH}_3)_2\text{CO} + \text{NX}^- + \text{H}^+$	$2.0 \times 10^9$		p.r.	P.b.k.	76A075
128.	<b>4-Aminophenoxide ion</b>					
128.020	$\cdot\text{CH}_2\text{CHO} + \text{NH}_2\text{C}_6\text{H}_4\text{O}^- \rightarrow$ $\text{CH}_3\text{CHO} + \text{NH}_2\text{C}_6\text{H}_4\text{O}\cdot$	$2.1 \times 10^9$	$\sim 11.5$	p.r.	Soln. contg. N <sub>2</sub> O and ethylene glycol.	79A051
129.	<b>4-Aminopyrimidine</b>					
129.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{A}$ $(\text{CH}_3)_2\dot{\text{C}}\text{O}^- + \text{A}$		0.8- 13.0	p.r.	No <i>e</i> -transfer.	77A034
130.	<b>Aniline</b>					
130.036	$\cdot\text{CF}_3 + \text{C}_6\text{H}_5\text{NH}_2 \rightarrow$ addn.	$(4.7 \pm 0.9) \times 10^6$	9-10	p.r.	P.b.k. at 330 nm in N <sub>2</sub> O-satd. soln. contg. CF <sub>3</sub> Cl; c.k. rel. to $k(\text{CF}_3 + \text{HCO}_2^-) = 3.4 \times 10^5$ gave $k = 5.6 \times 10^6$ .	70G407
131.	<b>9,10-Anthraquinone</b>					
131.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{A} \rightarrow$ semiquinone	$(1.6 \pm 0.1) \times 10^9$	7.0	p.r.	P.b.k. at 400 nm in N <sub>2</sub> O-satd. soln. contg. 2-PrOH.	73A104

TABLE 2. Rate constants for reactions of aliphatic radicals with organic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
131.097	$\text{CH}_3\dot{\text{C}}(\text{O}^-)\text{CH}_2\text{CO}_2^- + \text{A} \rightarrow$ semiquinone	$(6.7 \pm 0.7) \times 10^8$	9.2	p.r.	P.b.k. at 400 nm in Ar-satd. soln. contg. acetoacetate and 1 mol L <sup>-1</sup> <i>tert</i> -BuOH.	73A104
132.	<b>9,10-Anthraquinone-1-sulfonate ion</b>					
132.147	$\cdot\text{CO}_2^- + \text{A} \rightarrow$ semiquinone	$1.0 \times 10^9$ $3.3 \times 10^9$	3 7	p.r.	P.b.k.	72G391
133.	<b>9,10-Anthraquinone-2-sulfonate ion</b>					
133.056	$\text{NH}_2\dot{\text{C}}\text{HCO}_2^- + \text{A} \rightarrow$ semiquinone	$(2.2 \pm 0.2) \times 10^9$	8.0	p.r.	P.b.k. at 400 nm in N <sub>2</sub> O-satd. soln. contg. glycine.	73A104
133.068	$\text{R} + \text{A} \rightarrow$ semiquinone (R = Radicals from triglycine)	$(1.4 \pm 0.1) \times 10^9$	10	p.r.	P.b.k. at 400 nm in N <sub>2</sub> O-satd. soln. contg. triglycine.	73A104
133.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{A} \rightarrow$ semiquinone	$(3.0 \pm 0.3) \times 10^9$	7.0	p.r.	P.b.k. at 400 nm in N <sub>2</sub> O-satd. soln. contg. 2-PrOH.	73A104
		$(5.6 \pm 0.6) \times 10^9$		p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> 2-PrOH.	76A070
133.097	$\text{CH}_3\dot{\text{C}}(\text{O}^-)\text{CH}_2\text{CO}_2^- + \text{A} \rightarrow$ semiquinone	$(2.1 \pm 0.2) \times 10^9$	9.2	p.r.	P.b.k. at 400 nm. in Ar-satd. soln. contg. acetoacetate and <i>tert</i> -BuOH.	73A104
133.115	$\cdot\text{CHOHCO}_2^- + \text{A} \rightarrow$ semiquinone	$(7.1 \pm 0.7) \times 10^8$	7.0	p.r.	P.b.k. at 400 nm in N <sub>2</sub> O-satd. soln. contg. glycolate.	73A104
133.147	$\cdot\text{CO}_2^- + \text{A} \rightarrow$ semiquinone	$2.8 \times 10^9$ $3.1 \times 10^9$ $(1.6 \pm 0.2) \times 10^9$	3 7 7	p.r. p.r.	P.b.k. in soln. contg. formate.	72G391
				p.r.	P.b.k. at 400 nm in N <sub>2</sub> O-satd. soln. contg. formate.	73A104
134.	<b>9,10-Anthraquinone-2,6-disulfonate ion</b>					
134.056	$\text{NH}_2\dot{\text{C}}\text{HCO}_2^- + \text{A} \rightarrow$ semiquinone	$(2.6 \pm 0.3) \times 10^9$	8.0	p.r.	P.b.k. at 400 nm in N <sub>2</sub> O-satd. soln. contg. glycine.	73A104
134.068	$\text{R} + \text{A} \rightarrow$ semiquinone (R = Radicals from triglycine)	$(1.8 \pm 0.2) \times 10^9$	10	p.r.	P.b.k. at 400 nm in N <sub>2</sub> O-satd. soln. contg. triglycine.	73A104
134.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{A} \rightarrow$ semiquinone	$(4.6 \pm 0.5) \times 10^9$	7.0	p.r.	P.b.k. at 400 nm in N <sub>2</sub> O-satd. soln. contg. 2-PrOH.	73A104
134.097	$\text{CH}_3\dot{\text{C}}(\text{O}^-)\text{CH}_2\text{CO}_2^- + \text{A} \rightarrow$ semiquinone	$(7.2 \pm 0.7) \times 10^8$	9.2	p.r.	P.b.k. at 400 nm. in Ar-satd. soln. contg. acetoacetate and <i>tert</i> -BuOH.	73A104
134.117	$\text{CH}_3\dot{\text{C}}\text{OHCO}_2\text{H} + \text{A}$	$3.0 \times 10^9$	7.0	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. $5 \times 10^{-3}$ mol L <sup>-1</sup> lactate; 58% <i>e</i> - transfer.	75A051
134.147	$\cdot\text{CO}_2^- + \text{A} \rightarrow$ semiquinone	$(2.4 \pm 0.2) \times 10^9$	7.0	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. formate.	73A104
135.	<b>Ascorbate ion</b>					
135.020	$\cdot\text{CH}_2\text{CHO} + \text{A}^{\cdot-} (+ \text{H}_2\text{O}) \rightarrow$ $\text{CH}_3\text{CHO} + \cdot\text{A}^- + \text{OH}^-$	$8.8 \times 10^7$	7	p.r.	Radical from ClCH <sub>2</sub> CH <sub>2</sub> OH by reaction with OH and HCl elimination.	79A051
135.042	$\cdot\text{CH}(\text{CO}_2^-)_2 + \text{AH}^- \rightarrow$ $\text{CH}_2(\text{CO}_2^-)_2 + \cdot\text{A}^-$	$(1.3 \pm 0.1) \times 10^7$	7.5	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. 0.8 mol L <sup>-1</sup> malonate.	73R006
135.075	$\cdot\text{CH}_2\text{OH} + \text{AH}^-$	$<10^6$		p.r.		77A036
135.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{AH}^- \rightarrow$ $(\text{CH}_3)_2\text{CHOH} + \cdot\text{A}^-$	$(1.2 \pm 0.1) \times 10^6$	6.1	p.r.	P.b.k. in soln. contg. 1 mol L <sup>-1</sup> acetone and 2 mol L <sup>-1</sup> 2-PrOH.	73R006
136.	<b>Azobenzene</b>					
136.075	$\cdot\text{CH}_2\text{O}^- + \text{C}_6\text{H}_5\text{N}=\text{NC}_6\text{H}_5 \rightarrow$ $\text{CH}_2\text{O} + [\text{C}_6\text{H}_5\text{N}=\text{NC}_6\text{H}_5]^-$	$1 \times 10^9$	14	p.r.	P.b.k. at 380 nm in soln. contg. MeOH; $k$ same for <i>syn</i> - and <i>anti</i> - isomers.	77A169
136.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{C}_6\text{H}_5\text{N}=\text{NC}_6\text{H}_5 \rightarrow$ $(\text{CH}_3)_2\text{CO} + \text{H}^+ + \cdot[\text{C}_6\text{H}_5\text{N}=\text{NC}_6\text{H}_5]$	$4 \times 10^8$	~7	p.r.	P.b.k. at 380 nm in soln. contg. 2-PrOH; <i>anti</i> -isomer.	77A169
	$(\text{CH}_3)_2\dot{\text{C}}\text{O}^- + \text{C}_6\text{H}_5\text{N}=\text{NC}_6\text{H}_5 \rightarrow$ $(\text{CH}_3)_2\text{CO} + \cdot[\text{C}_6\text{H}_5\text{N}=\text{NC}_6\text{H}_5]$	$2 \times 10^9$	14	p.r.	P.b.k. at 380 nm in soln. contg. 2-PrOH; <i>anti</i> -isomer.	77A169
137.	<b>Benzophenone</b>					
137.075	$\cdot\text{CH}_2\text{O}^- + (\text{C}_6\text{H}_5)_2\text{CO} \rightarrow$ $\text{CH}_2\text{O} + (\text{C}_6\text{H}_5)_2\dot{\text{C}}\text{O}^-$	$1.2 \times 10^8$	13	p.r.	P.b.k. at 610 nm in N <sub>2</sub> O-satd. soln. 1 mol L <sup>-1</sup> MeOH.	75A125



TABLE 2. Rate constants for reactions of aliphatic radicals with organic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
137.076	$\text{CH}_3\dot{\text{C}}\text{HO}^- + (\text{C}_6\text{H}_5)_2\text{CO} \rightarrow$ $\text{CH}_3\text{CHO} + (\text{C}_6\text{H}_5)_2\dot{\text{C}}\text{O}^-$	$1 \times 10^9$	13	p.r.	P.b.k. at 610 nm in N <sub>2</sub> O-satd. soln. contg. EtOH; $E_a \approx 3.1$ kcal mol <sup>-1</sup> (13 kJ mol <sup>-1</sup> ).	74A010
137.078	$(\text{CH}_3)_2\dot{\text{C}}\text{O}^- + (\text{C}_6\text{H}_5)_2\text{CO} \rightarrow$ $(\text{CH}_3)_2\text{CO} + (\text{C}_6\text{H}_5)_2\dot{\text{C}}\text{O}^- \rightarrow$	$2.6 \times 10^8$	13	p.r.	P.b.k. at 610 nm in N <sub>2</sub> O-satd. soln.	75A125
		$1.2 \times 10^9$	12	p.r.	P.b.k.	68G308
		$(1.6 \pm 0.2) \times 10^9$	13.1	p.r.	P.b.k. at 605 nm in N <sub>2</sub> O-satd. soln. contg. 2 mol L <sup>-1</sup> 2-PrOH.	72G359
137.142	$\text{R} + (\text{C}_6\text{H}_5)_2\text{CO} \rightarrow (\text{C}_6\text{H}_5)_2\dot{\text{C}}\text{O}^-$ (R = Electron adduct of glycine anhydride)	$7.0 \times 10^8$	13	p.r.	P.b.k. at 610 nm in N <sub>2</sub> O-satd. soln. contg. 2-PrOH.	75A125
		$(2.2 \pm 0.3) \times 10^9$ $(2.5 \pm 0.4) \times 10^9$	5.5 12.3	p.r.	P.b.k. at 330 nm (320 at pH 12.3) in soln. contg. 1 mol L <sup>-1</sup> <i>tert</i> -BuOH.	71G554
137.143	$\text{R} + (\text{C}_6\text{H}_5)_2\text{CO} \rightarrow (\text{C}_6\text{H}_5)_2\dot{\text{C}}\text{O}^-$ (R = Electron adduct of alanine anhydride)	$(1.6 \pm 0.2) \times 10^9$ $(1.9 \pm 0.3) \times 10^9$	5.2 12.2	p.r.	P.b.k. at 330 nm (320 at pH 12.2) in soln. contg. 1 mol L <sup>-1</sup> <i>tert</i> -BuOH.	71G554
137.144	$\text{R} + (\text{C}_6\text{H}_5)_2\text{CO} \rightarrow (\text{C}_6\text{H}_5)_2\dot{\text{C}}\text{O}^-$ (R = Electron adduct of sarcosine anhydride)	$(2.3 \pm 0.2) \times 10^9$ $(2.4 \pm 0.2) \times 10^9$	5.2 12.2	p.r.	P.b.k. at 330 nm (320 at pH 12.2) in soln. contg. 1 mol L <sup>-1</sup> <i>tert</i> -BuOH.	71G554
138.	<b>Benzoquinone</b>					
138.056	$\text{NH}_2\dot{\text{C}}\text{HCO}_2^- + \text{Q} \rightarrow$ semiquinone	$(3.9 \pm 0.4) \times 10^9$	8.0	p.r.	P.b.k. at 400 nm in N <sub>2</sub> O-satd. soln. contg. glycine.	73A104
138.062	$\text{R} + \text{Q} \rightarrow$ semiquinone (R = Radical from glycine anhydride)	$2.2 \times 10^9$	10.5	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. glycine anhydride; 87% <i>e</i> -transfer.	73A052
138.068	$\text{R} + \text{Q} \rightarrow$ semiquinone (R = Radicals from triglycine)	$(2.5 \pm 0.2) \times 10^9$	10	p.r.	P.b.k. at 400 nm in N <sub>2</sub> O-satd. soln. contg. triglycine	73A104
138.075	$\cdot\text{CH}_2\text{OH} + \text{Q} \rightarrow \text{CH}_2\text{O} + \text{H}^+ + \cdot\text{Q}^-$	$6.1 \times 10^9$	nat	p.r.	P.b.k. at 430nm in N <sub>2</sub> O-satd. soln. contg. 1 mol L <sup>-1</sup> MeOH.	71G619
		$4.8 \times 10^9$	6.2	p.r.	P.b.k. at 430 nm in N <sub>2</sub> O-satd. soln. contg. 1 mol L <sup>-1</sup> MeOH.	73G049
138.076	$\text{CH}_3\dot{\text{C}}\text{HOH} + \text{Q} \rightarrow$ $\text{CH}_3\text{CHO} + \text{H}^+ + \cdot\text{Q}^-$	$4.5 \times 10^9$	nat	p.r.	P.b.k. at 430 nm in N <sub>2</sub> O-satd. soln. contg. 1 mol L <sup>-1</sup> EtOH.	71G619
138.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{Q} \rightarrow$ $(\text{CH}_3)_2\text{CO} + \text{H}^+ + \cdot\text{Q}^-$	$5.0 \times 10^9$	nat	p.r.	P.b.k. at 430 nm in N <sub>2</sub> O-satd. soln. contg. 1 mol L <sup>-1</sup> 2-PrOH.	71G619
		$(5.4 \pm 0.5) \times 10^9$	7.0	p.r.	P.b.k. at 400 nm in N <sub>2</sub> O-satd. soln. contg. 2-PrOH.	73A104
		$5 \times 10^9$	6.9	p.r.	P.b.k. at 430 nm in N <sub>2</sub> O-satd. soln. contg. 0.2 mol L <sup>-1</sup> 2-PrOH.	73G049
		$5.0 \times 10^9$	7	p.r.	P.b.k. in soln. contg. 1 mol L <sup>-1</sup> acetone and 1 mol L <sup>-1</sup> 2-PrOH.	73C125
138.092	$\text{R} + \text{Q} \rightarrow \cdot\text{Q}^-$ (R = Radicals from sodium dodecylsulfate)	$1.2 \times 10^9$		p.r.	P.b.k. at 430 nm in soln. contg. 0.1 mol L <sup>-1</sup> sodium dodecylsulfate $k(\text{R} + \text{micelle}) = 9.9 \times 10^8$ .	78A261
138.108	$\text{R} + \text{Q} \rightarrow$ semiquinone (R = Radicals from deoxyribose)	$2.7 \times 10^9$	5.6	p.r.	P.b.k. at 430 nm in N <sub>2</sub> O-satd. soln. contg. deoxyribose.	73G049
138.115	$\cdot\text{CHOHCO}_2^- + \text{Q} \rightarrow \cdot\text{Q}^-$	$2.2 \times 10^9$	7.0	p.r.	P.b.k. at 400 nm in N <sub>2</sub> O-satd. soln. contg. glycolate 72% <i>e</i> -transfer.	73A052 73A104
138.116	$\text{CH}_3\dot{\text{C}}\text{OHCONH}_2 + \text{Q} \rightarrow \cdot\text{Q}^-$	$2.0 \times 10^9$	5.0	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln.	73A052
		$3.6 \times 10^9$	7.3		contg. lactamide.	
138.117	$\text{CH}_3\dot{\text{C}}\text{OHCO}_2^- + \text{Q} \rightarrow \cdot\text{Q}^-$	$6.5 \times 10^9$ $\sim 7.0 \times 10^9$	7.3 10.8	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. lactate; 97% <i>e</i> -transfer.	73A052
138.147	$\cdot\text{CO}_2^- + \text{Q} \rightarrow \text{CO}_2 + \cdot\text{Q}^-$	$6.6 \times 10^9$	$\sim 7$	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. 0.2 mol L <sup>-1</sup> formate.	71G619
		$7 \times 10^9$	6.9	p.r.	P.b.k. at 430 nm in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> formate.	73G049
		$(6.6 \pm 0.7) \times 10^9$	7.0	p.r.	P.b.k. at 400 nm in N <sub>2</sub> O-satd. soln. contg. formate.	73A104
139.	<b>3-Benzoyl-1-methylpyridinium ion</b>					
139.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{C}_6\text{H}_5\text{COC}_5\text{H}_4\text{N}^+\text{CH}_3 \rightarrow$ $(\text{CH}_3)_2\text{CO} + (\text{C}_6\text{H}_5\text{COHC}_5\text{H}_4\text{NCH}_3)^{\cdot+}$	$(2.3 \pm 0.3) \times 10^9$	5.0, 1.0	p.r.	P.b.k. at 530 nm in N <sub>2</sub> O-satd. soln. contg. 2 mol L <sup>-1</sup> 2-PrOH.	72G359

TABLE 2. Rate constants for reactions of aliphatic radicals with organic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
140.	<b>2-Benzoylpyridine</b>					
140.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{C}_6\text{H}_5\text{COC}_5\text{H}_4\text{NH}^+ \rightarrow (\text{CH}_3)_2\text{CO} + (\text{C}_6\text{H}_5\text{COHC}_5\text{H}_4\text{NH})^{\cdot+}$	$(3.0 \pm 0.3) \times 10^9$	1.0	p.r.	P.b.k. at 500 nm, as well as at 330 nm, in N <sub>2</sub> O-satd. soln. contg. 2 mol L <sup>-1</sup> 2-PrOH.	72G359
	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{C}_6\text{H}_5\text{COC}_5\text{H}_4\text{N} \rightarrow (\text{CH}_3)_2\text{CO} + (\text{C}_6\text{H}_5\text{COC}_5\text{H}_4\text{NH})^{\cdot}$	$(1.5 \pm 0.2) \times 10^8$	5.9	p.r.	P.b.k. at 500 nm, as well as at 330 nm, in N <sub>2</sub> O-satd. soln. contg. 2 mol L <sup>-1</sup> 2-PrOH.	72G359
	$(\text{CH}_3)_2\dot{\text{C}}\text{O}^- + \text{C}_6\text{H}_5\text{COC}_5\text{H}_4\text{N} \rightarrow (\text{CH}_3)_2\text{CO} + (\text{C}_6\text{H}_5\text{COC}_5\text{H}_4\text{N})^{\cdot-}$	$(2.3 \pm 0.2) \times 10^9$	13.2	p.r.	P.b.k. at 550 nm, as well as at 330 nm, in N <sub>2</sub> O-satd. soln. contg. 2 mol L <sup>-1</sup> 2-PrOH.	72G359
141.	<b>3-Benzoylpyridine</b>					
141.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{C}_6\text{H}_5\text{COC}_5\text{H}_4\text{NH}^+ \rightarrow (\text{CH}_3)_2\text{CO} + (\text{C}_6\text{H}_5\text{COHC}_5\text{H}_4\text{NH})^{\cdot+}$	$(1.7 \pm 0.2) \times 10^9$	0.9	p.r.	P.b.k. at 500 nm, as well as at 330 nm (at pH 0.5 giving $k = 2.3 \times 10^9$ ) in N <sub>2</sub> O-satd. soln. contg. 2 mol L <sup>-1</sup> 2-PrOH.	72G359
	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{C}_6\text{H}_5\text{COC}_5\text{H}_4\text{N} \rightarrow (\text{CH}_3)_2\text{CO} + (\text{C}_6\text{H}_5\text{COC}_5\text{H}_4\text{NH})^{\cdot}$	$(1.0 \pm 0.2) \times 10^8$	5.1	p.r.	P.b.k. at 530 nm, as well as at 330 nm in N <sub>2</sub> O-satd. soln. contg. 2 mol L <sup>-1</sup> 2-PrOH.	72G359
	$(\text{CH}_3)_2\dot{\text{C}}\text{O}^- + \text{C}_6\text{H}_5\text{COC}_5\text{H}_4\text{N} \rightarrow (\text{CH}_3)_2\text{CO} + (\text{C}_6\text{H}_5\text{COC}_5\text{H}_4\text{N})^{\cdot-}$	$(2.0 \pm 0.2) \times 10^9$	13.0	p.r.	P.b.k. at 605 nm, as well as at 341 nm, in N <sub>2</sub> O-satd. soln. contg. 2 mol L <sup>-1</sup> 2-PrOH.	72G359
142.	<b>4-Benzoylpyridine</b>					
142.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{C}_6\text{H}_5\text{COC}_5\text{H}_4\text{NH}^+ \rightarrow (\text{CH}_3)_2\text{CO} + (\text{C}_6\text{H}_5\text{COHC}_5\text{H}_4\text{NH})^{\cdot+}$	$(2.5 \pm 0.2) \times 10^9$	0.7	p.r.	P.b.k. at 510 nm in N <sub>2</sub> O-satd. soln. contg. 2 mol L <sup>-1</sup> 2-PrOH.	72G359
	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{C}_6\text{H}_5\text{COC}_5\text{H}_4\text{N} \rightarrow (\text{CH}_3)_2\text{CO} + (\text{C}_6\text{H}_5\text{COC}_5\text{H}_4\text{NH})^{\cdot}$	$(2.4 \pm 0.4) \times 10^8$	7.7	p.r.	P.b.k. at 500 nm in N <sub>2</sub> O-satd. soln. contg. 2 mol L <sup>-1</sup> 2-PrOH.	72G359
	$(\text{CH}_3)_2\dot{\text{C}}\text{O}^- + \text{C}_6\text{H}_5\text{COC}_5\text{H}_4\text{N} \rightarrow (\text{CH}_3)_2\text{CO} + (\text{C}_6\text{H}_5\text{COC}_5\text{H}_4\text{N})^{\cdot-}$	$(2.5 \pm 0.2) \times 10^9$	13.2	p.r.	P.b.k. at 575 nm in N <sub>2</sub> O-satd. soln. contg. 2 mol L <sup>-1</sup> 2-PrOH.	72G359
	<i>Benzyl viologen See 1,1'-Dibenzyl-4,4'-bipyridinium ion 171.</i>					
	<i>Biacetyl See 2,3-Butanedione 148.</i>					
143.	<b>2,2'-Bipyridine</b>					
143.075	$\cdot\text{CH}_2\text{OH} + \text{bpy}$	$< 10^6$	7	p.r.	P.b.k.	79A148
	$\cdot\text{CH}_2\text{O}^- + \text{bpy}$	$< 10^6$	alk.	p.r.	P.b.k.	79A148
143.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{bpy}$	$< 10^6$	7	p.r.	P.b.k.	79A148
	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{bpyH}^+ \rightarrow (\text{CH}_3)_2\text{CO} + \text{bpyH}_2^{\cdot+}$	$3.5 \times 10^8$	1.4, 3.7	p.r.	P.b.k. at 375 nm in N <sub>2</sub> O-satd. soln. contg. 0.2 mol L <sup>-1</sup> 2-PrOH.	79A148
	$(\text{CH}_3)_2\dot{\text{C}}\text{O}^- + \text{bpy} \rightarrow (\text{CH}_3)_2\text{CO} + \text{bpy}^{\cdot-}$	$1.3 \times 10^8$	13.0	p.r.	P.b.k. at 365 nm in soln. contg. 0.1 mol L <sup>-1</sup> 2-PrOH and 0.1 mol L <sup>-1</sup> acetone.	79A148
143.147	$\cdot\text{CO}_2^- + \text{bpy}$	$< 10^6$	7	p.r.	P.b.k.	79A148
	$\cdot\text{CO}_2^- + \text{bpyH}^+$	$5.0 \times 10^8$	4.4	p.r.	P.b.k. at 375 nm in N <sub>2</sub> O-satd. soln. contg. 0.2 mol L <sup>-1</sup> formate.	79A148
144.	<b>1,1'-Bis(2-hydroxyethyl)-4,4'-bipyridinium ion</b>					
144.147	$\cdot\text{CO}_2^- + \text{BP}^{2+} \rightarrow \text{CO}_2 + \cdot\text{BP}^+$	$1.9 \times 10^{10}$	6.8	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> formate.	78A321
145.	<b>2-Bromo-5-nitrothiazole</b>					
145.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{NX} \rightarrow (\text{CH}_3)_2\text{CO} + \text{H}^+ + \cdot\text{NX}^{\cdot}$	$3.0 \times 10^9$		p.r.	P.b.k.	76A075
146.	<b>5-Bromouracil</b>					
146.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{BrU}$	$2 \times 10^7$ (rel.)		p.r.	C.k. rel. to $k(\text{R} + \text{PNAP}) = 3.8 \times 10^9$ .	73A140
146.147	$\cdot\text{CO}_2^- + \text{BrU} \rightarrow \text{CO}_2 + \text{Br}^- + \text{U}^{\cdot}$	$> 1.0 \times 10^8$		p.r.	P.b.k. at 440 nm (BrUCO <sub>2</sub> <sup>-</sup> ) in N <sub>2</sub> O-satd. soln. contg. formate.	69G826

TABLE 2. Rate constants for reactions of aliphatic radicals with organic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
147.	<b>Butadiene</b>					
147.001	$\cdot\text{CH}_3 + \text{C}_4\text{H}_6 \rightarrow \text{addn.}$	$1.25 \times 10^6$ (rel.)		$\gamma$ -r.	C.k. with MeOH in soln. contg. MeI; obs. $G(\text{CH}_3)$ ; rel. to $k(\text{CH}_3 + \text{O}_2) = 4.7 \times 10^9$ .	67G041
147.047	$\cdot\text{CF}_3 + \text{C}_4\text{H}_6 \rightarrow \text{addn.}$	$(5.8 \pm 1.0) \times 10^8$ (rel.)	9-10	$\gamma$ -r.	C.k. with 2-PrOH in soln. contg. $\text{CF}_3\text{Cl}$ ; rel. to $k(\text{CF}_3 + \text{HCO}_2^-) = 3.4 \times 10^5$ .	70G407
148.	<b>2,3-Butanedione</b>					
148.075	$\cdot\text{CH}_2\text{OH} + \text{CH}_3\text{COCOCH}_3 (\text{B}) \rightarrow \text{CH}_2\text{O} + \text{H}^+ + \cdot\text{B}^-$	$1.1 \times 10^8$ $(6.5 \pm 1) \times 10^7$		p.r.	P.b.k. at 300 nm in $\text{N}_2\text{O}$ -satd. soln. contg. $10^{-2}$ mol L <sup>-1</sup> MeOH.	68G249
148.076	$\text{CH}_3\dot{\text{C}}\text{HOH} + \text{B} \rightarrow \text{CH}_3\text{CHO} + \text{H}^+ + \cdot\text{B}^-$	$5.6 \times 10^8$	5-6	p.r.	D.k. in $\text{N}_2\text{O}$ -satd. soln. contg. $10^{-2}$ mol L <sup>-1</sup> MeOH.	72A018
148.077	$\text{CH}_3\text{CH}_2\dot{\text{C}}\text{HOH} + \text{B} \rightarrow \text{CH}_3\text{CH}_2\text{CHO} + \text{H}^+ + \cdot\text{B}^-$	$6.8 \times 10^8$		p.r.	P.b.k. at 300 nm in $\text{N}_2\text{O}$ -satd. soln. contg. $10^{-2}$ mol L <sup>-1</sup> EtOH.	68G249
148.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{B} \rightarrow (\text{CH}_3)_2\text{CO} + \text{H}^+ + \cdot\text{B}^-$	$8.6 \times 10^8$ $6.0 \times 10^8$		p.r.	P.b.k. at 300 nm in $\text{N}_2\text{O}$ -satd. soln. contg. $10^{-2}$ mol L <sup>-1</sup> 2-PrOH.	68G249
148.080	$\text{CH}_3\text{CH}_2\dot{\text{C}}\text{OHCH}_3 + \text{B} \rightarrow \text{CH}_3\text{COCH}_2\text{CH}_3 + \text{H}^+ + \cdot\text{B}^-$	$7.2 \times 10^8$	5-6	p.r.	D.k. in $\text{N}_2\text{O}$ -satd. soln. contg. $10^{-2}$ mol L <sup>-1</sup> 2-PrOH.	72A018
148.083	$c\text{-C}_6\text{H}_{11}\dot{\text{C}}\text{HOH} + \text{B} \rightarrow \text{C}_6\text{H}_{11}\text{CHO} + \text{H}^+ + \cdot\text{B}^-$	$2.6 \times 10^8$		p.r.	P.b.k. at 300 nm in $\text{N}_2\text{O}$ -satd. soln. contg. cyclohexanemethanol.	68G249
148.117	$\text{CH}_3\dot{\text{C}}\text{OHCO}_2^- + \text{B}$	$2.8 \times 10^7$	6.0	p.r.	D.k. in $\text{N}_2\text{O}$ -satd. soln. contg. $10^{-2}$ mol L <sup>-1</sup> lactate.	72A018
149.	<b>1-Butene</b>					
149.001	$\cdot\text{CH}_3 + \text{C}_4\text{H}_8 \rightarrow \text{addn.}$	$3.0 \times 10^4$ (rel.)		$\gamma$ -r.	C.k. with MeOH in soln. contg. MeI; obs. $G(\text{CH}_3)$ ; rel. to $k(\text{CH}_3 + \text{O}_2) = 4.7 \times 10^9$ .	67G041
149.047	$\cdot\text{CF}_3 + \text{C}_4\text{H}_8 \rightarrow \text{addn.}$	$(5.3 \pm 0.7) \times 10^7$ (rel.)	9-10	$\gamma$ -r.	C.k. with 2-PrOH; rel. to $k(\text{CF}_3 + \text{HCO}_2^-) = 3.4 \times 10^5$ .	70G407
<i>1,1'-Butylene-2,2'-bipyridinium ion See Tetramethylene-2,2'-bipyridinium ion 341.</i>						
150.	<b>Camphor</b>					
150.147	$\cdot\text{CO}_2^- + \text{RC}=\text{O}$	$<10^6$	13	p.r.	D.k. of $\cdot\text{CO}_2^-$ at 260 nm. in $\text{N}_2\text{O}$ -satd. soln. contg. 0.1 mol L <sup>-1</sup> formate and 0.1 mol L <sup>-1</sup> NaOH same in the presence and absence of $10^{-3}$ mol L <sup>-1</sup> camphor.	79A191
151.	<b>3-Carbamoyl-1-methylpyridinium ion</b>					
151.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{CH}_3\text{N}^+\text{C}_5\text{H}_4\text{CONH}_2$	$(3.6 \pm 0.7) \times 10^8$	9.5	p.r.	P.b.k. (pyridinyl radical) in $\text{N}_2\text{O}$ -satd. soln. contg. 1-2 mol L <sup>-1</sup> 2-PrOH.	74A089
151.147	$\cdot\text{CO}_2^- + \text{CH}_3\text{N}^+\text{C}_5\text{H}_4\text{CONH}_2$	$4.6 \times 10^9$	8.5	p.r.	P.b.k. at 420 nm in $\text{N}_2\text{O}$ -satd. soln. contg. 0.1 mol L <sup>-1</sup> formate.	68G441
152.	<b>Carbon tetrachloride</b>					
152.075	$\cdot\text{CH}_2\text{OH} + \text{CCl}_4 \rightarrow \cdot\text{CCl}_3 + \text{Cl}^- + \text{CH}_2\text{O} + \text{H}^+$	$<10^6$		p.r.	Condy.; $G(\text{Cl}^-) \approx 0.3G(\cdot\text{CH}_2\text{OH})$ .	71G778
152.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{CCl}_4 \rightarrow \cdot\text{CCl}_3 + \text{Cl}^- + (\text{CH}_3)_2\text{CO} + \text{H}^+$	$1.0 \times 10^8$ $7 \times 10^8$ (rel.)		p.r.	Condy.; build-up of HCl in $\text{N}_2\text{O}$ -satd. soln. contg. 0.1 mol L <sup>-1</sup> 2-PrOH.	71G778
				p.r.	C.k. with <i>p</i> -nitroacetophenone in soln. contg. 2-PrOH and acetone; rel. to $k(\text{R} + \text{PNAP}) = 3.8 \times 10^9$ .	73A140 73A150
152.093	$\text{CH}_3\dot{\text{C}}\text{HOC}_2\text{H}_5 + \text{CCl}_4 \rightarrow \text{Cl}^-$	$2.5 \times 10^7$		p.r.	Condy.; buildup of HCl in $\text{N}_2\text{O}$ -satd. soln. contg. Et <sub>2</sub> O.	71G778

TABLE 2. Rate constants for reactions of aliphatic radicals with organic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
152.094	$\cdot\text{O}\dot{\text{C}}\text{H}(\text{CH}_2)_3\cdot + \text{CCl}_4 \rightarrow \text{Cl}\cdot$	$2.0 \times 10^7$		p.r.	Condy.; buildup of HCl in N <sub>2</sub> O-satd. soln. contg. tetrahydrofuran.	71G778
152.147	$\cdot\text{CO}_2^- + \text{CCl}_4$	no reaction		p.r.	Condy.	71G778
153. 153.078	<b>3-Carboxy-1-methylpyridinium ion</b> $(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{CH}_3\text{N}^+\text{C}_5\text{H}_4\text{CO}_2^-$	$1.0 \times 10^8$	9.2	p.r.	P.b.k. (pyridinyl radical) at 400 nm in N <sub>2</sub> O-satd. soln. contg. 0.5 mol L <sup>-1</sup> 2-PrOH.	74A106
154. 154.075	<b>4-Carboxy-1-methylpyridinium ion</b> $\cdot\text{CH}_2\text{O}^- + \text{CH}_3\text{N}^+\text{C}_5\text{H}_4\text{CO}_2^-$	$3.8 \times 10^9$	12.7	p.r.	P.b.k. at 395 nm in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> MeOH.	79A051
154.076	$\text{CH}_3\dot{\text{C}}\text{HO}^- + \text{CH}_3\text{N}^+\text{C}_5\text{H}_4\text{CO}_2^-$	$3.8 \times 10^9$	12.7	p.r.	P.b.k. at 395 nm in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> EtOH.	79A051
154.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{CH}_3\text{N}^+\text{C}_5\text{H}_4\text{CO}_2^-$	$1.5 \times 10^9$	8.6	p.r.	P.b.k. at 400 nm in soln contg. 0.5 mol L <sup>-1</sup> 2-PrOH.	79A106
<i>Catechol See 1,2-Dihydroxybenzene 176.</i>						
155. 155.078	<b>Chloral hydrate</b> $(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{Cl}_3\text{CH}(\text{OH})_2$	$1 \times 10^6$ (rel.)		p.r.	C.k. with <i>p</i> -nitroacetophenone in soln. contg. 2-PrOH and acetone; rel. to $k(\text{R} + \text{PNAP}) = 3.8 \times 10^9$ .	73A140 73A150
<i>Chloranil See Tetrachlorobenzoquinone 338.</i>						
156. 156.001	<b>Chloroacetic acid</b> $\cdot\text{CH}_3 + \text{ClCH}_2\text{CO}_2\text{H} \rightarrow \text{CH}_4 + \text{Cl}\dot{\text{C}}\text{HCO}_2\text{H}$	$3.0 \times 10^3$	~1	chem.	Radical from dimethyl sulfoxide in Ti <sup>III</sup> -H <sub>2</sub> O <sub>2</sub> soln.; est. from esr meas. and values for competing reactions.	75D188
156a. 156a.078	<b><i>m</i>-Chlorobenzonitrile</b> $(\text{CH}_3)_2\dot{\text{C}}\text{O}^- + \text{ClC}_6\text{H}_4\text{CN} \rightarrow (\text{CH}_3)_2\dot{\text{C}}\text{O} + (\text{ClC}_6\text{H}_4\text{CN})\cdot^-$	$(2 \pm 0.5) \times 10^8$	13	p.r.	P.b.k. at 310 nm (radical anion); $k < 10^7$ at pH 7.	81A001
157. 157.078	<b>Chloroform</b> $(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{CHCl}_3$	$< 1 \times 10^7$ (rel.)		p.r.	C.k. with <i>p</i> -nitroacetophenone in soln. contg. 2-PrOH and acetone; rel. to $k(\text{R} + \text{PNAP}) = 3.8 \times 10^9$ .	73A140
158. 158.111	<b><i>p</i>-Chloronitrobenzene</b> $\text{R} + \text{ClC}_6\text{H}_4\text{NO}_2$ (R = Radicals from glucose)	$4.0 \times 10^8$		p.r.		77R167
158.147	$\cdot\text{CO}_2^- + \text{ClC}_6\text{H}_4\text{NO}_2$	$3 \times 10^8$		p.r.		77R167
159. 159.056	<b>Crystal Violet</b> $\text{NH}_2\dot{\text{C}}\text{HCO}_2^- + \text{dye}$	$1.2 \times 10^9$	7	p.r.	D.k. at 525 nm in N <sub>2</sub> O-satd. soln. contg. glycine; 56% <i>e</i> -transfer.	73A078
159.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{dye}$	$2.3 \times 10^9$	7	p.r.	D.k. at 525 nm in N <sub>2</sub> O-satd. soln. contg. 2-PrOH; 84% <i>e</i> -transfer.	73A078
159.147	$\cdot\text{CO}_2^- + \text{dye} \rightarrow \text{CO}_2 + \text{dye}\cdot$	$1.5 \times 10^9$	7	p.r.	D.k. at 520 nm as well as p.b.k. at ~400 nm.	73A078
160. 160.001	<b>Cyanoacetic acid</b> $\cdot\text{CH}_3 + \text{CNCH}_2\text{CO}_2\text{H} \rightarrow \text{CH}_4 + \text{CN}\dot{\text{C}}\text{HCO}_2\text{H}$	$> 6.6 \times 10^3$	~1	chem.	Radical from dimethyl sulfoxide in Ti <sup>III</sup> -H <sub>2</sub> O <sub>2</sub> soln.; est. from esr and values for competing reactions.	75D188

*2-Cyanoethanol See 3-Hydroxypropionitrile 230.*

TABLE 2. Rate constants for reactions of aliphatic radicals with organic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
160a.	<b>Cystamine</b>					
160a.142	R + Cys → <i>e</i> -transfer (R = Electron adduct of glycine anhydride)	(1.2 ± 0.3) × 10 <sup>8</sup>	5.7, 11.0	p.r.	D.k. at 265 nm (R) in soln. contg. 1 mol L <sup>-1</sup> <i>tert</i> -BuOH.	71G554
160a.143	R + Cys → <i>e</i> -transfer (R = Electron adduct of alanine anhydride)	(1.1 ± 0.2) × 10 <sup>8</sup>	5.1, 11.4	p.r.	D.k. at 265 nm (R) in soln. contg. 1 mol L <sup>-1</sup> <i>tert</i> -BuOH.	71G554
161.	<b>Cysteamine</b>					
161.016	·CH <sub>2</sub> C(CH <sub>3</sub> ) <sub>2</sub> OH + RSH → (CH <sub>3</sub> ) <sub>3</sub> COH + RS·	1.8 × 10 <sup>7</sup>		p.r.	P.b.k. at 410 nm (RSSR <sup>-</sup> ) in N <sub>2</sub> O-satd. soln. contg. <i>tert</i> -BuOH.	68G132
161.018	R' + RSH (R' = Radicals from allyl alcohol)	<1 × 10 <sup>7</sup>		p.r.	P.b.k. at 410 nm (RSSR <sup>-</sup> ) in N <sub>2</sub> O-satd. soln. contg. allyl alcohol.	68G132
161.033	·CH <sub>2</sub> COCH <sub>3</sub> + RSH → CH <sub>3</sub> COCH <sub>3</sub> + RS·	~4 × 10 <sup>8</sup>		p.r.	P.b.k. at 410 nm (RSSR <sup>-</sup> ) in N <sub>2</sub> O-satd. soln. contg. acetone.	68G132
161.075	·CH <sub>2</sub> OH + RSH → CH <sub>3</sub> OH + RS·	6.8 × 10 <sup>7</sup>	7.6	p.r.	P.b.k. at 410 nm (RSSR <sup>-</sup> ) in N <sub>2</sub> O-satd. soln. contg. MeOH; $k \approx 1 \times 10^7$ at pH 12.	68G132
161.076	CH <sub>3</sub> ·CHOH + RSH → CH <sub>3</sub> CH <sub>2</sub> OH + RS·	2.9 × 10 <sup>7</sup> 1.4 × 10 <sup>8</sup>	7	p.r. p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. MeOH. P.b.k. at 410 nm (RSSR <sup>-</sup> ) in N <sub>2</sub> O-satd. soln. contg. EtOH.	72R003 68G132
161.078	(CH <sub>3</sub> ) <sub>2</sub> ·CHOH + RSH → (CH <sub>3</sub> ) <sub>2</sub> CHOH + RS·	4.2 × 10 <sup>8</sup>		p.r.	P.b.k. at 410 nm (RSSR <sup>-</sup> ) in N <sub>2</sub> O-satd. soln. contg. 2-PrOH.	68G132
161.079	CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> ·CHOH + RSH → CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> CH <sub>2</sub> OH + RS·	8.2 × 10 <sup>7</sup>		p.r.	P.b.k. at 410 nm (RSSR <sup>-</sup> ) in N <sub>2</sub> O-satd. soln. contg. 1-BuOH.	68G132
161.081	(CH <sub>3</sub> ) <sub>2</sub> CH·CHOH + RSH → (CH <sub>3</sub> ) <sub>2</sub> CHCH <sub>2</sub> OH + RS·	1.4 × 10 <sup>8</sup>		p.r.	P.b.k. at 410 nm (RSSR <sup>-</sup> ) in N <sub>2</sub> O-satd. soln. contg. 2-methyl-1-propanol.	68G132
161.095	·CHOHCH <sub>2</sub> CH <sub>2</sub> CH <sub>2</sub> OH + RSH → (CH <sub>2</sub> CH <sub>2</sub> OH) <sub>2</sub> + RS·	1.1 × 10 <sup>8</sup>		p.r.	P.b.k. at 410 nm (RSSR <sup>-</sup> ) in N <sub>2</sub> O-satd. soln. contg. 1,4-butanediol.	68G132
161.111	R' + RSH → R'H + RS· (R' = Radicals from glucose)	3.2 × 10 <sup>7</sup>		p.r.	P.b.k. at 410 nm (RSSR <sup>-</sup> ) in N <sub>2</sub> O-satd. soln. contg. glucose.	68A132
162.	<b>Cysteine</b>					
162.075	·CH <sub>2</sub> OH + RSH → CH <sub>3</sub> OH + RS·	0.5[k(CH <sub>2</sub> OH + O <sub>2</sub> )]		γ-r.	C.k. with O <sub>2</sub> ; obs. CH <sub>2</sub> O and glycol yields.	69G524
162.062	R + Cys → no <i>e</i> -transfer (R = Radicals from glycine anhydride + OH)	4.2 × 10 <sup>7</sup> <10 <sup>7</sup>	7 6,10, 12	p.r. p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. MeOH. No change in d.k. at 265 nm on addn. of cysteine in N <sub>2</sub> O-satd. soln.	72R003 71G554
162.142	R + Cys → <i>e</i> -transfer (R = Electron adduct of glycine anhydride)	(2.1 ± 0.4) × 10 <sup>8</sup>	6.4	p.r.	D.k. at 265 nm in soln. contg. 1 mol L <sup>-1</sup> <i>tert</i> -BuOH.	71G554
162.143	R + Cys → <i>e</i> -transfer (R = Electron adduct of alanine anhydride)	(1.4 ± 0.3) × 10 <sup>8</sup>	7.4	p.r.	D.k. at 265 nm in soln. contg. 1 mol L <sup>-1</sup> <i>tert</i> -BuOH.	71G554
162.144	R + Cys → <i>e</i> -transfer (R = Electron adduct of sarcosine anhydride)	(1.5 ± 0.3) × 10 <sup>8</sup>	7.0	p.r.	D.k. at 265 nm in soln. contg. 1 mol L <sup>-1</sup> <i>tert</i> -BuOH.	71G554
163.	<b>Cytochrome c</b>					
163.016	·CH <sub>2</sub> C(CH <sub>3</sub> ) <sub>2</sub> OH + Fe <sup>3+</sup> cyt c			p.r.	No reaction; p.b.k. at 550 nm in N <sub>2</sub> O-satd. soln. contg. 10 <sup>-2</sup> mol L <sup>-1</sup> <i>tert</i> -BuOH.	78A288
163.062	R + Fe <sup>3+</sup> cyt c (R = Radical from glycine anhydride)	<10 <sup>7</sup>	6.8	p.r.	P.b.k. at 550 nm in N <sub>2</sub> O-satd. soln. contg. glycine anhydride.	78A288
163.075	·CH <sub>2</sub> OH + Fe <sup>3+</sup> cyt c → Fe <sup>2+</sup> cyt c	(3.0 ± 0.5) × 10 <sup>7</sup>	7	p.r.	Abs. change at 550 and 435 nm in N <sub>2</sub> O-satd. soln. contg. MeOH; 100% redn.	79A153

TABLE 2. Rate constants for reactions of aliphatic radicals with organic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
163.076	$\text{CH}_3\dot{\text{C}}\text{HOH} + \text{Fe}^{3+}\text{cyt c} \rightarrow$ $\text{Fe}^{2+}\text{cyt c}$	$2.4 \times 10^8$	2.0	p.r.		77A128
		$(1.4 \pm 0.2) \times 10^8$	7	p.r.	Abs. change at 550 and 435 nm in N <sub>2</sub> O-satd. soln. contg. EtOH; 100% redn.	79A153
		$1.8 \times 10^8$	~7	p.r.	Abs. change at 550 and 450 nm in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> EtOH; see also 74A007 and 77A128.	79A312
163.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{Fe}^{3+}\text{cyt c} \rightarrow$ $\text{Fe}^{2+}\text{cyt c}$	$3.8 \times 10^8$ $1.6 \times 10^8$	7 9.3	p.r.	P.b.k. at 550 nm; radical from 2-PrOH.	75A012
163.096	$\cdot\text{CHOHC}(\text{CH}_2\text{OH})_3 + \text{Fe}^{3+}\text{cyt c} \rightarrow$ $\text{Fe}^{2+}\text{cyt c}$	$<10^6$	5.6	p.r.	P.b.k. at 550 nm; radical from pentaerythritol.	75A012
		$1.4 \times 10^8$	9.1			
		$1.6 \times 10^8$	9.8			
163.106	$\cdot\text{CHOHCHOHCH}_2\text{OH} + \text{Fe}^{3+}\text{cyt c}$ $(+ \text{CH}_2\text{OH}\dot{\text{C}}\text{OHCH}_2\text{OH})$	$2.5 \times 10^6$	7	p.r.	P.b.k. at 550 nm; radicals from glycerol.	75A012
163.113	$\cdot\text{A}^- + \text{Fe}^{3+}\text{cyt c} \rightarrow$ $\text{A} + \text{Fe}^{2+}\text{cyt c}$ ( $\cdot\text{A}^-$ = radical from ascorbate ion)	$6.6 \times 10^3$	7.4	p.r.	D.k. at 360 nm in N <sub>2</sub> O-satd. soln. contg. ascorbate	75A240
163.117	$\text{CH}_3\dot{\text{C}}\text{OHC}\text{O}_2^- + \text{Fe}^{3+}\text{cyt c} \rightarrow$ $\text{Fe}^{2+}\text{cyt c}$	$(2.4 \pm 0.2) \times 10^8$		p.r.	P.b.k. at 550 nm in soln. contg. lactate.	74A007
		$2.3 \times 10^8$	7	p.r.	P.b.k. at 550 nm in N <sub>2</sub> O-satd. soln. contg. 0.2 mol L <sup>-1</sup> lactate.	75A012
		$2.5 \times 10^8$	11			
163.120	$^-\text{O}_2\dot{\text{C}}\text{COHCH}_2\text{CO}_2^- + \text{Fe}^{3+}\text{cyt c} \rightarrow$ $\text{Fe}^{2+}\text{cyt c}$	$(8.5 \pm 0.8) \times 10^7$	6.4	p.r.	P.b.k. at 550 nm in malate soln.; $E_a = 3$ kcal mol <sup>-1</sup> (12 kJ mol <sup>-1</sup> ).	74A007
163.121	$^-\text{O}_2\dot{\text{C}}\text{COHCHOHCO}_2^- + \text{Fe}^{3+}\text{cyt c}$	$1.7 \times 10^8$	7	p.r.	P.b.k. at 550 nm in tartrate soln.	75A012
163.142	$\text{R} + \text{Fe}^{3+}\text{cyt c}$ (R = Electron adduct of glycine anhydride)	$8 \times 10^8$	6.8	p.r.	P.b.k. at 500 nm in soln. contg. glycine anhydride.	78A288
163.147	$\cdot\text{CO}_2^- + \text{Fe}^{3+}\text{cyt c} \rightarrow$ $\text{CO}_2 + \text{Fe}^{2+}\text{cyt c}$	$\sim 5 \times 10^8$	>4	p.r.	P.b.k. at 550 nm in soln. contg. 0.03–1 mol L <sup>-1</sup> formate; concn. effect.	71G327
		$\sim 3 \times 10^9$	<4			
		$6.9 \times 10^8$	7	p.r.	P.b.k. at 550 nm in N <sub>2</sub> O-satd. soln. contg. formate.	75A012
		$2.5 \times 10^8$	10.8			
		$1.0 \times 10^9$	6.2	p.r.	Abs. change at 450 and 550 nm in 0.1 mol L <sup>-1</sup> formate soln.; at pH 6.2 $E_a = 2.7$ kcal mol <sup>-1</sup> and $A = 1.0 \times 10^{11}$ ; at pH 8.7 $E_a = 3.0$ and $A = 1.0 \times 10^{11}$ .	76A127
		$6.3 \times 10^8$	8.7			
		$(7 \pm 0.5) \times 10^8$	7.4	p.r.	P.b.k. in N <sub>2</sub> O-satd. 0.1 mol L <sup>-1</sup> formate; $k = (5.0 \pm 0.6) \times 10^8$ in basic soln.	77A096
		$7.4 \times 10^8$	6.7	p.r.		77A128
		$9.4 \times 10^8$	2.0			
		$1.3 \times 10^9$	7.0	p.r.	P.b.k. at 550 nm in 1 atm N <sub>2</sub> O, and 0.01 mol L <sup>-1</sup> formate.	78A288
	$1.0 \times 10^8$	~7	p.r.	D.k. in formate soln.; $I = 0.1$ .	79A312	
164.	<b>Cytochrome c, acetylated</b>					
164.076	$\text{CH}_3\dot{\text{C}}\text{HOH} + \text{Ac-cyt c}$	$2.5 \times 10^8$	~7	p.r.	Abs. change at 550 and 450 nm in N <sub>2</sub> O-satd. 0.1 mol L <sup>-1</sup> EtOH soln.; $I = 0.005$ .	79A312
164.147	$\cdot\text{CO}_2^- + \text{Ac-cyt c}$	$1.5 \times 10^9$	~7	p.r.	D.k. at 550 nm in formate soln.; $I = 0.1$ .	79A312
165.	<b>Cytochrome c, carboxymethylated</b>					
165.076	$\text{CH}_3\dot{\text{C}}\text{HOH} + \text{Cxm-cyt c}$	$3.5 \times 10^8$	~7	p.r.	Abs. change at 550 nm and 450 nm in N <sub>2</sub> O-satd. 0.1 mol L <sup>-1</sup> EtOH soln.	79A312
165.121	$^-\text{O}_2\dot{\text{C}}\text{COHCHOHCO}_2^- + \text{Cxm-cyt c}$	$2.8 \times 10^7$	7	p.r.	Radical from tartrate ion	78A288
165.147	$\cdot\text{CO}_2^- + \text{Cxm-cyt c}$	$1.4 \times 10^8$	7	p.r.	Radical from formate ion.	78A288
		$1.3 \times 10^8$	~7	p.r.	D.k. at 550 nm in formate soln.; $I = 0.1$ .	79A312
167.	<b>Cytochrome c, succinylated</b>					
167.076	$\text{CH}_3\dot{\text{C}}\text{HOH} + \text{Suc-cyt c}$	$1.8 \times 10^9$	~7	p.r.	Abs. change at 550 and 450 nm in N <sub>2</sub> O-satd. 0.1 mol L <sup>-1</sup> EtOH soln.	79A312

TABLE 2. Rate constants for reactions of aliphatic radicals with organic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
188.	<b>1,3-Dinitrobenzene</b>					
188.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{C}_6\text{H}_4(\text{NO}_2)_2 \rightarrow$ $(\text{CH}_3)_2\dot{\text{C}}\text{O} + \text{H}^+ + [\text{C}_6\text{H}_4(\text{NO}_2)_2]^-$	$3.6 \times 10^9$	7	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. 2-PrOH; $k$ at pH 0.8 within 20–30%.	76A111
189.	<b>1,4-Dinitrobenzene</b>					
189.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{C}_6\text{H}_4(\text{NO}_2)_2 \rightarrow$ $(\text{CH}_3)_2\dot{\text{C}}\text{O} + \text{H}^+ + [\text{C}_6\text{H}_4(\text{NO}_2)_2]^-$	$3.2 \times 10^9$	7	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. 2-PrOH; $k$ at pH 0.8 within 20–30%.	76A111
190.	<b>2,4-Dinitrobenzoate ion</b>					
190.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + ^-\text{O}_2\text{CC}_6\text{H}_3(\text{NO}_2)_2 \rightarrow$ $(\text{CH}_3)_2\dot{\text{C}}\text{O} + \text{H}^+ +$ $[^-\text{O}_2\text{CC}_6\text{H}_3(\text{NO}_2)_2]^-$	$2.9 \times 10^9$	7	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. 2-PrOH; $k$ at pH 0.8 within 20–30%.	76A111
190.147	$\cdot\text{CO}_2^- + ^-\text{O}_2\text{CC}_6\text{H}_3(\text{NO}_2)_2 \rightarrow$ $\text{CO}_2 + [^-\text{O}_2\text{CC}_6\text{H}_3(\text{NO}_2)_2]^-$	$1.8 \times 10^9$	7	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. formate.	76A111
191.	<b>2,5-Dinitrobenzoate ion</b>					
191.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + ^-\text{O}_2\text{CC}_6\text{H}_3(\text{NO}_2)_2 \rightarrow$ $(\text{CH}_3)_2\dot{\text{C}}\text{O} + \text{H}^+ +$ $[^-\text{O}_2\text{CC}_6\text{H}_3(\text{NO}_2)_2]^-$	$3.3 \times 10^9$	7	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. 2-PrOH; $k$ at pH 0.8 within 20–30%.	76A111
191.147	$\cdot\text{CO}_2^- + ^-\text{O}_2\text{CC}_6\text{H}_3(\text{NO}_2)_2 \rightarrow$ $\text{CO}_2 + [^-\text{O}_2\text{CC}_6\text{H}_3(\text{NO}_2)_2]^-$	$1.9 \times 10^9$	7	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. formate.	76A111
192.	<b>3,4-Dinitrobenzoate ion</b>					
192.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + ^-\text{O}_2\text{CC}_6\text{H}_3(\text{NO}_2)_2 \rightarrow$ $(\text{CH}_3)_2\dot{\text{C}}\text{O} + \text{H}^+ +$ $[^-\text{O}_2\text{CC}_6\text{H}_3(\text{NO}_2)_2]^-$	$3.2 \times 10^9$	7	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. 2-PrOH; $k$ at pH 0.8 within 20–30%.	76A111
192.147	$\cdot\text{CO}_2^- + ^-\text{O}_2\text{CC}_6\text{H}_3(\text{NO}_2)_2 \rightarrow$ $\text{CO}_2 + [^-\text{O}_2\text{CC}_6\text{H}_3(\text{NO}_2)_2]^-$	$1.8 \times 10^9$	7	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. formate.	76A111
193.	<b>3,5-Dinitrobenzoate ion</b>					
193.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + ^-\text{O}_2\text{CC}_6\text{H}_3(\text{NO}_2)_2 \rightarrow$ $(\text{CH}_3)_2\dot{\text{C}}\text{O} + \text{H}^+ +$ $[^-\text{O}_2\text{CC}_6\text{H}_3(\text{NO}_2)_2]^-$	$3.1 \times 10^9$	7	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. 2-PrOH; $k$ at pH 0.8 within 20–30%.	76A111
193.147	$\cdot\text{CO}_2^- + ^-\text{O}_2\text{CC}_6\text{H}_3(\text{NO}_2)_2 \rightarrow$ $\text{CO}_2 + [^-\text{O}_2\text{CC}_6\text{H}_3(\text{NO}_2)_2]^-$	$2.5 \times 10^9$	7	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. formate.	76A111
194.	<b>3,5-Dinitrobenzotrile</b>					
194.111	$\text{R} + (\text{NO}_2)_2\text{C}_6\text{H}_3\text{CN} \rightarrow$ $[(\text{NO}_2)_2\text{C}_6\text{H}_3\text{CN}]^-$ (R = Radicals from glucose)	$1.0 \times 10^9$		p.r.		77R167
195.	<b>1-(2,4-Dinitrophenyl)pyridinium ion</b>					
195.100	$\text{R} + (\text{NO}_2)_2\text{C}_6\text{H}_4\text{N}^+\text{C}_5\text{H}_5 \rightarrow$ $[(\text{NO}_2)_2\text{C}_6\text{H}_4\text{N}^+\text{C}_5\text{H}_5]^-$ (R = Radicals from glucose)	$1.0 \times 10^9$		p.r.		77R167
195.147	$\cdot\text{CO}_2^- + (\text{NO}_2)_2\text{C}_6\text{H}_4\text{N}^+\text{C}_5\text{H}_5 \rightarrow$ $[(\text{NO}_2)_2\text{C}_6\text{H}_4\text{N}^+\text{C}_5\text{H}_5]^-$	$4 \times 10^8$		p.r.		77R167
196.	<b>1,1'-Diphenyl-4,4'-bipyridinium ion</b>					
196.147	$\cdot\text{CO}_2^- + \text{BP}^{2+} \rightarrow \text{CO}_2 + \text{BP}^{\cdot+}$	$1.3 \times 10^{10}$	6.8	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> formate ion.	78A321
197.	<b>Dithiothreitol</b>					
197.016	$\cdot\text{CH}_2\text{C}(\text{CH}_3)_2\text{OH} +$ $\text{HSCH}_2\text{CHOHCHOHCH}_2\text{SH} \rightarrow$ $(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{RS}\cdot (\rightarrow \text{RSSR}\cdot)$	$(6.8 \pm 0.6) \times 10^7$	7	p.r.	P.b.k. at 390 nm in N <sub>2</sub> O-satd. soln. contg. 1 mol L <sup>-1</sup> <i>tert</i> -BuOH.	73A020
197.075	$\cdot\text{CH}_2\text{OH} + \text{RSH} \rightarrow$ $\text{CH}_3\text{OH} + \text{RS}\cdot$	$(6.8 \pm 0.6) \times 10^7$	7	p.r.	P.b.k. at 390 nm in N <sub>2</sub> O-satd. soln. contg. 1 mol L <sup>-1</sup> MeOH.	73A020
197.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{RSH} \rightarrow$ $(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{RS}\cdot$	$(2.1 \pm 0.2) \times 10^8$	7	p.r.	P.b.k. at 390 nm in soln. of 2 mol L <sup>-1</sup> 2-PrOH and 1 mol L <sup>-1</sup> acetone.	73A020

Dopamine See 2-(3,4-Dihydroxyphenyl)ethylamine 179.

TABLE 2. Rate constants for reactions of aliphatic radicals with organic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
198. 198.078	<b>Duroquinone</b> $(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{Q} \rightarrow$ $(\text{CH}_3)_2\text{CO} + \text{H}^+ + \cdot\text{Q}^-$	$4.0 \times 10^9$	7	p.r.	P.b.k. in soln. contg. 1 mol L <sup>-1</sup> 2-PrOH and 1 mol L <sup>-1</sup> acetone.	73G125
199. 199.076	<b>Eosin</b> $\text{CH}_3\dot{\text{C}}\text{HOH} + \text{S} \rightarrow$ $\text{CH}_3\text{CHO} + \cdot\text{S}^- + \text{H}^+$	$(1.1 \pm 0.2) \times 10^9$	8.5– 9.0	p.r.	P.b.k. at 405 nm in soln. contg. 10 <sup>-2</sup> mol L <sup>-1</sup> EtOH and 10 <sup>-3</sup> mol L <sup>-1</sup> H <sub>2</sub> O <sub>2</sub> .	67G038
199.147	$\cdot\text{CO}_2^- + \text{S} \rightarrow \text{CO}_2 + \cdot\text{S}^- + \text{H}^+$	$(2.5 \pm 0.5) \times 10^8$	8.5– 9.0	p.r.	P.b.k. at 405 nm in soln. contg. 10 <sup>-2</sup> mol L <sup>-1</sup> HCO <sub>2</sub> <sup>-</sup> and 10 <sup>-3</sup> mol L <sup>-1</sup> H <sub>2</sub> O <sub>2</sub> .	67G038
200. 200.001	<b>Ethanol</b> $\cdot\text{CH}_3 + \text{CH}_3\text{CH}_2\text{OH} \rightarrow$ $\text{CH}_4 + \text{CH}_3\dot{\text{C}}\text{HOH}$	$5.9 \times 10^2$ (rel.)		$\gamma$ -r.	C.k. with O <sub>2</sub> ; radical from MeI; rel. to $k(\text{CH}_3 + \text{O}_2) = 4.7 \times 10^9$ .	67G041
200.014	$\cdot\text{CH}_2\text{CH}_2\text{OH} + \text{C}_2\text{H}_5\text{OH} \rightarrow$ $\text{C}_2\text{H}_5\text{OH} + \text{CH}_3\dot{\text{C}}\text{HOH}$	$16 \pm 3$		$\gamma$ -r.	Calcd. from obs. yields and assumed mechanism in oxid. of EtOH by H <sub>2</sub> O <sub>2</sub> .	70G338
200.047	$\cdot\text{CF}_3 + \text{C}_2\text{H}_5\text{OH} \rightarrow$ $\text{CF}_3\text{H} + \text{C}_2\text{H}_4\text{OH}$	$(4.6 \pm 0.5) \times 10^4$ (rel.)	9–10	$\gamma$ -r.	C.k. with $\cdot\text{CF}_3$ addn. to propylene; obs. CF <sub>3</sub> H yield; rel. to $k(\text{CF}_3 + \text{HCO}_2^-) = 3.4 \times 10^5$ .	70G407
201. 201.001	<b>Ethyl acetate</b> $\cdot\text{CH}_3 + \text{CH}_3\text{CO}_2\text{Et} \rightarrow$ $\text{CH}_4 + \text{CH}_3\text{CO}_2\dot{\text{C}}\text{HCH}_3$	$<1.7 \times 10^3$	~1	chem.	Radical from dimethyl sulfoxide in Ti <sup>III</sup> -H <sub>2</sub> O <sub>2</sub> soln.; est. from esr meas. and values for competing reactions.	75D188
202. 202.001	<b>Ethylene</b> $\cdot\text{CH}_3 + \text{CH}_2=\text{CH}_2 \rightarrow \cdot\text{CH}_2\text{CH}_2\dot{\text{C}}\text{H}_3$	$4.9 \times 10^3$ (rel.)		$\gamma$ -r.	C.k. with 2-PrOH in soln. contg. MeI; obs. $G(\text{CH}_4)$ ; rel. to $k(\cdot\text{CH}_3 + \text{O}_2) = 4.7 \times 10^9$ .	67G041
202.014	$\cdot\text{CH}_2\text{CH}_2\text{OH} + \text{CH}_2=\text{CH}_2 \rightarrow$ $\cdot\text{CH}_2\text{CH}_2\text{CH}_2\dot{\text{C}}\text{H}_2\text{OH}$	$(1.6 \pm 0.5) \times 10^6$ (rel.) $(4.1 \pm 1.2) \times 10^6$ (rel.) $(3 \pm 2) \times 10^4$ (rel.)	4.5  2	p.r.  $\gamma$ -r.	Radical from OH + ethylene; contains ~10% (pH 4.5) and ~50% (pH 2) $\cdot\text{C}_2\text{H}_5$ ; obs. rate of addn. of Cu <sup>+</sup> to ethylene (Cu <sup>+</sup> from OH + Cu <sup>2+</sup> in N <sub>2</sub> O-satd. soln.); rel. to $k(\text{R} + \text{Cu}^{2+}) = 1.9 \times 10^7$ (pH 4.5) and $2.2 \times 10^7$ (pH 2). Calcd. from dose rate effect on yields of $\alpha,\omega$ -diols in N <sub>2</sub> O-satd. soln. contg. ethylene assuming termination rate constant of chain reaction is $5 \times 10^8$ .	78A322  80A054
202.046	$\cdot\text{CFCl}_2 + \text{CH}_2=\text{CH}_2 \rightarrow \text{CFCl}_2\text{CH}_2\dot{\text{C}}\text{H}_2$	$\sim 4 \times 10^7$	5.9	p.r.	Est. from condy meas. in soln. contg. CFCl <sub>3</sub> .	71G026
202.047	$\cdot\text{CF}_3 + \text{CH}_2=\text{CH}_2 \rightarrow \cdot\text{CH}_2\text{CH}_2\dot{\text{C}}\text{F}_3$	$(4.0 \pm 0.6) \times 10^7$ (rel.) $\sim 7 \times 10^8$	9–10  5.9	$\gamma$ -r.  p.r.	C.k. with 2-PrOH (H abstr. by CF <sub>3</sub> ); obs. CF <sub>3</sub> H yield; rel. to $k(\cdot\text{CF}_3 + \text{HCO}_2^-) = 3.4 \times 10^5$ . Est. from condy. meas. in soln. contg. CF <sub>3</sub> Cl.	70G407  71G026
203. 203.147	<b>1,1'-Ethylene-2,2'-bipyridinium ion</b> $\cdot\text{CO}_2^- + \text{BP}^{2+} \rightarrow \text{CO}_2 + \cdot\text{BP}^+$	$4.0 \times 10^9$ $1.2 \times 10^{10}$	7.0 6.8	p.r. p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. 0.2 mol L <sup>-1</sup> formate ion. P.b.k. in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> formate ion.	76A169 78A321
204. 204.075	<b>Ethylene glycol</b> $\cdot\text{CH}_2\text{OH} + \text{HOCH}_2\text{CH}_2\text{OH} \rightarrow$ $\text{CH}_3\text{OH} + \text{HOCHCH}_2\text{OH}$	$\sim 10^3$ – $10^4$		$\gamma$ -r.	Est. from dose effect on yields in MeOH soln.	71G929



TABLE 2. Rate constants for reactions of aliphatic radicals with organic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
205.	<b>Ethyl ether</b>					
205.048	$\cdot\text{CCl}_3 + \text{CH}_3\text{CH}_2\text{OEt} \rightarrow$ $\text{CHCl}_3 + \text{CH}_3\dot{\text{C}}\text{HOEt}$	35		$\gamma$ -r.	Calcd. from dependence of $G(\text{Cl}^\cdot)$ on dose rate in soln. contg. $2 \times 10^{-3}$ mol L <sup>-1</sup> $\text{CCl}_4$ and 0.5 mol L <sup>-1</sup> ethyl ether; assume $2k(\text{R} + \text{R}) = 10^9$ .	71G778
206.	<b>N-Ethylmaleimide (NEM)</b>					
206.016	$\cdot\text{CH}_2\text{C}(\text{CH}_3)_2\text{OH} + \text{NEM} \rightarrow \cdot\text{NEM}-\text{R}$			p.r.	No $e$ -transfer; very low addn. rate; radical from <i>tert</i> -BuOH.	72G144
206.053	$\text{CH}_3\text{CONH}\dot{\text{C}}\text{H}_2 + \text{NEM} \rightarrow \cdot\text{NEM}-\text{R}$	$\sim 10^8$	6-7	p.r.	100% addn. based on abs. spectra; radical from <i>N</i> -methylacetamide.	72G144
206.075	$\cdot\text{CH}_2\text{OH} + \text{NEM} \rightarrow$ $\cdot\text{NEM}^- + \cdot\text{NEM}-\text{CH}_2\text{OH}$	$2.4 \times 10^9$ (uncor.)	6-7	p.r.	P.b.k. in $\text{N}_2\text{O}$ -satd. soln. contg. MeOH; 15% $e$ -transfer, 85% addn. based on abs. spectra.	72G144
206.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{NEM} \rightarrow$ $\cdot\text{NEM}^- + \cdot\text{NEM}-\text{R}$	$5.0 \times 10^9$ (uncor.)	6-7	p.r.	47% $e$ -transfer, 50% addn. based on abs. spectra; radical from 2-ProH.	72G144
206.109	$\text{R} + \text{NEM}$ (R = Radicals from ribose)	$2.1 \times 10^9$ (uncor.)	6-7	p.r.	30% $e$ -transfer, 20% addn. based on abs. spectra.	72G144
206.141	$\text{R} + \text{NEM} \rightarrow \cdot\text{NEM}^-$ (R = Electron adduct of dimethyl fumarate)	$2.2 \times 10^9$		p.r.	D.k.	73G097
206.147	$\cdot\text{CO}_2^- + \text{NEM} \rightarrow \text{CO}_2 + \cdot\text{NEM}^-$	$5.4 \times 10^9$	6-7	p.r.	P.b.k. in $\text{N}_2\text{O}$ -satd. soln. contg. formate; 100% $e$ -transfer based on abs. spectra.	72G144
207.	<b>4-Ethylphenoxide ion</b>					
207.020	$\cdot\text{CH}_2\text{CHO} + \text{C}_2\text{H}_5\text{C}_6\text{H}_4\text{O}^-$ (+ $\text{H}_2\text{O}$ ) $\rightarrow \text{CH}_3\text{CHO} + \text{OH}^- +$ $\text{C}_2\text{H}_5\text{C}_6\text{H}_4\text{O}\cdot$	$7.0 \times 10^7$	$\sim 11.5$	p.r.	Soln. contg. $\text{N}_2\text{O}$ and ethylene glycol.	79A051
208.	<b>Ferredoxin</b>					
208.147	$\cdot\text{CO}_2^- + \text{ferredoxin}$	$(8.0 \pm 0.7) \times 10^7$	7.5	p.r.	D.k. at 420 nm in $\text{N}_2\text{O}$ -satd. soln. contg. 0.1 mol L <sup>-1</sup> formate.	73A064
	<i>Flagyl See Metronidazole 271.</i>					
	<i>Flavin mononucleotide (FMN) See Riboflavin 5'-phosphate 334.</i>					
209.	<b>Fluorescein</b>					
209.076	$\text{CH}_3\dot{\text{C}}\text{HOH} + \text{Dye} \rightarrow \text{semiquinone}$	$4.5 \times 10^8$	10.8	p.r.	D.k. at 500 nm in $\text{N}_2\text{O}$ -satd. soln. contg. EtOH.	73A078
209.147	$\cdot\text{CO}_2^- + \text{Dye} \rightarrow \text{semiquinone}$	$(2.6 \pm 0.9) \times 10^7$	10.4	p.r.	P.b.k. in $\text{N}_2\text{O}$ -satd. soln. contg. $10^{-2}$ mol L <sup>-1</sup> formate.	68G172
210.	<b>Folic acid</b>					
210.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{FH}_2^+$ $(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{FH} \rightarrow$ $(\text{CH}_3)_2\text{CO} + \text{H}^+ + \cdot\text{FH}^-$	$1.1 \times 10^9$ $4.0 \times 10^8$	$\sim 0.5$ 6.0	p.r.	P.b.k.; structure and abs. spectra of reduced species dependent on pH.	76A060
211.	<b>Formaldehyde</b>					
211.075	$\cdot\text{CH}_2\text{OH} + \text{CH}_2(\text{OH})_2 \rightarrow$ $\text{CH}_3\text{OH} + \cdot\text{CH}(\text{OH})_2$	$\sim 10^4$ - $10^5$		$\gamma$ -r.	Est. from dose effects on yields in soln. contg. MeOH.	71G929
212.	<b>Formate ion</b>					
212.047	$\cdot\text{CF}_3 + \text{HCO}_2^- \rightarrow \text{CF}_3\text{H} + \cdot\text{CO}_2^-$	$(3.4 \pm 0.7) \times 10^5$	9-10	p.r.	P.b.k. at 270 nm ( $\text{CO}_2^-$ ); radical from $\text{CF}_3\text{Cl} + e_{\text{aq}}^-$ .	70G407
213.	<b>N-Formylkynurenine</b>					
213.147	$\cdot\text{CO}_2^- + \text{FK} (+ \text{H}^+) \rightarrow$ $\text{CO}_2 + \cdot\text{FKH}$	$> 3 \times 10^7$	7.6	p.r.	P.b.k. (semiquinone) in $\text{N}_2\text{O}$ -satd. soln. contg. 0.1 mol L <sup>-1</sup> formate.	75F361

TABLE 2. Rate constants for reactions of aliphatic radicals with organic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
214.	<b>Fumarate ion</b>					
214.047	$\cdot\text{CF}_3 + \text{}^-\text{O}_2\text{CCH}=\text{CHCO}_2^- \rightarrow$ $\text{}^-\text{O}_2\text{C}\dot{\text{C}}\text{HCH}(\text{CF}_3)\text{CO}_2^-$	$\sim 10^8$		<i>e-r.</i>	Est. from esr.	71G284
214.075	$\cdot\text{CH}_2\text{OH} + \text{}^-\text{O}_2\text{CCH}=\text{CHCO}_2^- \rightarrow$ $\text{}^-\text{O}_2\text{C}\dot{\text{C}}\text{HCH}(\text{CH}_2\text{OH})\text{CO}_2^-$	$\sim 10^7$		<i>e-r.</i>	Est. by esr from dose rate effect on $\cdot\text{CH}_2\text{OH}$ and adduct radical (in 1 mol L <sup>-1</sup> MeOH and 0.01 mol L <sup>-1</sup> fumarate) assuming $2k(\text{R} + \text{R}) = 2.4 \times 10^9$ ; other radicals adding to fumarate ion were $\cdot\text{CH}_3$ , $\cdot\text{CHOHCH}_3$ , $(\text{CH}_3)_2\dot{\text{C}}\text{OH}$ , $\cdot\text{CHOHCH}_2\text{OH}$ , $\cdot\text{CH}_2\text{NH}_2$ , $\cdot\text{CH}_2\text{Cl}$ , $\cdot\text{CHClCO}_2^-$ , $\cdot\text{CO}_2^-$ , $\cdot\text{CF}_3$ , and $\cdot\text{CH}(\text{CO}_2^-)\text{CH}_2\text{CO}_2^-$ .	71G284
214.113	$\cdot\text{A}^- + \text{}^-\text{O}_2\text{CCH}=\text{CHCO}_2^-$ ( $\text{A}^-$ = ascorbate radical)	<10	8.7	<i>p.r.</i>	D.k. at 360 nm in N <sub>2</sub> O-satd. soln. contg. ascorbate ion.	75A240
214.147	$\cdot\text{CO}_2^- + \text{}^-\text{O}_2\text{CCH}=\text{CHCO}_2\text{H}$	$2.0 \times 10^7$ (uncor.)	4.0	<i>p.r.</i>	>30% <i>e</i> -transfer; no <i>e</i> -transfer at pH 10.0.	73G097
215.	<b>Fumaric acid</b>					
215.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{HO}_2\text{CCH}=\text{CHCO}_2\text{H}$	$9.0 \times 10^8$ (uncor.)	0.5	<i>p.r.</i>	14% <i>e</i> -transfer.	73G097
215a.	<b>Glutathione</b>					
215a.142	$\text{R} + \text{CSH} \rightarrow e$ transfer (R = Electron adduct of glycine anhydride)	$(1.8 \pm 0.3) \times 10^8$	6.4, 7.4	<i>p.r.</i>	D.k. at 265 nm in soln. contg. 1 mol L <sup>-1</sup> <i>tert</i> -BuOH.	71G554
216.	<b>Glutathione disulfide</b>					
216.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{GSSG}$	$\ll 10^7$	7	<i>p.r.</i>	No 420 nm abs. (RSSR <sup>-</sup> ) obs. in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> 2-PrOH.	72G388
216.142	$\text{R} + \text{GSSG} \rightarrow (\text{GSSG})^-$ (R = Electron adduct of glycine anhydride)	$(4.0 \pm 0.4) \times 10^7$	6.2	<i>p.r.</i>	D.k. at 265 nm in soln. contg. 1 mol L <sup>-1</sup> <i>tert</i> -BuOH.	71G554
216.147	$\cdot\text{CO}_2^- + \text{GSSG}$	$\ll 10^7$		<i>p.r.</i>	No 420 nm abs. (RSSR <sup>-</sup> ) obs. in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> formate.	72G388
217.	<b>Glycine</b>					
217.001	$\cdot\text{CH}_3 + \text{H}_2\text{NCH}_2\text{CO}_2^- \rightarrow$ $\text{CH}_4 + \text{H}_2\text{N}\dot{\text{C}}\text{HCO}_2^-$ $\cdot\text{CH}_3 + \text{H}_3\text{N}^+\text{CH}_2\text{CO}_2^- \rightarrow$ $\sim 4$ (rel.)	$\sim 1.2 \times 10^2$ (rel.) $\sim 4$ (rel.)	$\sim 10$	phot.	$\cdot\text{CH}_3$ from cumene hydroperoxide; obs. formn. of CH <sub>4</sub> and C <sub>2</sub> H <sub>6</sub> ; assume $2k(\text{R} + \text{R}) = 2 \times 10^9$ ; $k_{\text{H}}/k_{\text{D}} = 10.5$ at pH 11.5 [74F528].	70F280
218.	<b>Glycine anhydride</b>					
218.147	$\cdot\text{CO}_2^- + \text{-NHCH}_2\text{CONHCH}_2\text{C(O)-}$	<10 <sup>7</sup>	6.2	<i>p.r.</i>	No <i>e</i> -transfer obs. in N <sub>2</sub> O-satd. soln. contg. 0.2 mol L <sup>-1</sup> formate.	71G554
219.	<b>Glycolic acid</b>					
219.001	$\cdot\text{CH}_3 + \text{HOCH}_2\text{CO}_2\text{H} \rightarrow$ $\text{CH}_4 + \text{HO}\dot{\text{C}}\text{HCO}_2\text{H}$	$3.6 \times 10^3$	$\sim 1$	chem.	Radical from dimethylsulfoxide in Ti <sup>III</sup> -H <sub>2</sub> O <sub>2</sub> soln.; est. from esr meas. and values for competing reactions.	75D188
220.	<b>Hematoporphyrin</b>					
220.075	$\cdot\text{CH}_2\text{OH} + \text{PH}_2 \rightarrow \cdot\text{PH}_2^-$ $\cdot\text{CH}_2\text{O}^- + \text{PH}_2 \rightarrow \cdot\text{PH}_2^-$	$\leq 1 \times 10^7$ $(3.3 \pm 0.5) \times 10^8$	7.0 13.0	<i>p.r.</i>	P.b.k. at 600–650 nm in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> MeOH.	74A040
220.076	$\text{CH}_3\dot{\text{C}}\text{HO}^- + \text{PH}_2 \rightarrow \cdot\text{PH}_2^-$	$(7.0 \pm 1.0) \times 10^8$	13	<i>p.r.</i>	P.b.k. at 600–650 nm in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> EtOH.	74A040
220.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{PH}_2 \rightarrow \cdot\text{PH}_2^-$ $(\text{CH}_3)_2\dot{\text{C}}\text{O}^- + \text{PH}_2 \rightarrow \cdot\text{PH}_2^-$	$(2.4 \pm 0.4) \times 10^8$ $(1.1 \pm 0.2) \times 10^9$	7.0 13.0	<i>p.r.</i>	P.b.k. at 600–650 nm in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> 2-PrOH.	74A040
220.147	$\cdot\text{CO}_2^- + \text{PH}_2 \rightarrow \cdot\text{PH}_2^-$	$(4 \pm 1) \times 10^7$	13.0	<i>p.r.</i>	P.b.k. at 600–650 nm in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> formate.	74A040

TABLE 2. Rate constants for reactions of aliphatic radicals with organic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
221.	<b>Zinc hematoporphyrin</b>					
221.078	(CH <sub>3</sub> ) <sub>2</sub> ĊO <sup>-</sup> + ZnP → (CH <sub>3</sub> ) <sub>2</sub> CO + ZnP <sup>-</sup>	(1.0 ± 0.1) × 10 <sup>9</sup>	13.0	p.r.	P.b.k. at 600–650 nm in N <sub>2</sub> O-satd. soln. contg. 1 mol L <sup>-1</sup> 2-PrOH.	74A040
221a.	<b>Deuteroporphyrin dimethyl ester</b>					
221a.001	·CH <sub>3</sub> + DP	(1 to 2) × 10 <sup>7</sup>	~13	p.r.	Est. from abs. change in soln. contg. 6.5 mol L <sup>-1</sup> 2-PrOH, 0.7 mol L <sup>-1</sup> acetone and 2.3 × 10 <sup>-2</sup> mol L <sup>-1</sup> CH <sub>3</sub> I; cor. for ·CH <sub>3</sub> + ·CH <sub>3</sub> .	81A002
221a.078	(CH <sub>3</sub> ) <sub>2</sub> ĊO <sup>-</sup> + DP → DP <sup>-</sup>	(6 ± 1) × 10 <sup>8</sup>	~13	p.r.	Abs. change in soln. contg. 6.5 mol L <sup>-1</sup> 2-PrOH and 0.7 mol L <sup>-1</sup> acetone.	81A002
	<i>Deuteroporphyrin (ferri) See Deuterohemin 222.</i>					
	<i>Deuteroporphyrin (ferro) See Deuteroheme 223.</i>					
222.	<b>Deuterohemin</b>					
222.001	·CH <sub>3</sub> + DH(Fe <sup>III</sup> ) → addn.	(2.3 ± 0.5) × 10 <sup>9</sup> ~1.3 × 10 <sup>9</sup>	~13 7	p.r.	Abs. change in soln. contg. 6.5 mol L <sup>-1</sup> 2-PrOH and 4.1 × 10 <sup>-3</sup> mol L <sup>-1</sup> methyl iodide.	81A002
222.050	·CCl <sub>3</sub> + DH(Fe <sup>III</sup> )	<10 <sup>6</sup>	7.2	p.r.	No spectral change in soln. contg. 6.5 mol L <sup>-1</sup> 2-PrOH, 5 × 10 <sup>-3</sup> mol L <sup>-1</sup> CCl <sub>4</sub> and 10 <sup>-4</sup> mol L <sup>-1</sup> deuterohemin.	80A011
222.078	(CH <sub>3</sub> ) <sub>2</sub> ĊOH + DH(Fe <sup>III</sup> ) → DH(Fe <sup>II</sup> )	3.7 × 10 <sup>8</sup>	7.2	p.r.	D.k. in Ar-satd. soln. contg. 6.5 mol L <sup>-1</sup> 2-PrOH and 3.4 × 10 <sup>-2</sup> mol L <sup>-1</sup> acetone.	80A011
	(CH <sub>3</sub> ) <sub>2</sub> ĊO <sup>-</sup> + DH(Fe <sup>III</sup> ) → DH(Fe <sup>II</sup> )	(9 ± 1) × 10 <sup>6</sup>	~13	p.r.	D.k. in soln. contg. 6.5 mol L <sup>-1</sup> 2-PrOH.	81A002
223.	<b>Deuteroheme</b>					
223.001	·CH <sub>3</sub> + DH(Fe <sup>II</sup> ) → addn.	(3.9 ± 0.5) × 10 <sup>9</sup>	7	p.r.	Abs. change in 6.5 mol L <sup>-1</sup> 2-PrOH soln. of deuterohemin chemically reduced by dithionite to which methyl chloride was added.	81A002
223.043	·CH <sub>2</sub> Cl + DH(Fe <sup>II</sup> )	2 × 10 <sup>9</sup>	7.2	p.r.	Abs. change in soln. of deuterohemin chemically reduced by dithionite to which 4 × 10 <sup>-2</sup> mol L <sup>-1</sup> CH <sub>2</sub> Cl <sub>2</sub> was added.	80A011
223.048	·CCl <sub>3</sub> + DH(Fe <sup>II</sup> )	(2 ± 1) × 10 <sup>9</sup>	7.2	p.r.	Abs. change in soln. contg. 6.5 mol L <sup>-1</sup> 2-PrOH, 3.2 × 10 <sup>-2</sup> mol L <sup>-1</sup> acetone, CCl <sub>4</sub> , and deuterohemin, the latter reduced by (CH <sub>3</sub> ) <sub>2</sub> ĊOH.	80A011
223.078	(CH <sub>3</sub> ) <sub>2</sub> ĊOH + DH(Fe <sup>II</sup> )	(6.3 ± 0.5) × 10 <sup>8</sup>	7	p.r.	Abs. change in 6.5 mol L <sup>-1</sup> 2-PrOH soln. of deuterohemin chemically reduced by dithionite to which 0.7 mol L <sup>-1</sup> acetone was added.	81A002
224.	<b>Hemin (Protoferriheme IX)</b>					
224.076	CH <sub>3</sub> ĊHO <sup>-</sup> + H(Fe <sup>III</sup> ) → H(Fe <sup>II</sup> )	(9.0 ± 1.0) × 10 <sup>8</sup>	13	p.r.	Soln. 30% EtOH, N <sub>2</sub> O-satd.	74A040
	CH <sub>3</sub> ĊHOH + H(Fe <sup>III</sup> ) → H(Fe <sup>II</sup> )	7.7 × 10 <sup>8</sup>	7	p.r.	Redn. obs. at 560 nm in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> EtOH.	77A128
		(5.6 ± 0.6) × 10 <sup>8</sup>	9.2	p.r.	D.k. at 490 nm in N <sub>2</sub> O-satd. soln.	78A033
		(1.6 ± 0.6) × 10 <sup>9</sup>	4.0		contg. 1 mol L <sup>-1</sup> EtOH and 0.2 mol L <sup>-1</sup> Na dodecylsulfate (micelles).	
225.	<b>Hemin c</b>					
225.078	(CH <sub>3</sub> ) <sub>2</sub> ĊOH + H(Fe <sup>III</sup> ) → H(Fe <sup>II</sup> )	(2.8 ± 0.6) × 10 <sup>9</sup>	7.0	p.r.	P.b.k. at 413 nm in N <sub>2</sub> O-satd. soln. contg. 0.04 mol L <sup>-1</sup> 2-PrOH.	75A241
225.096	·CHOHC(CH <sub>2</sub> OH) <sub>3</sub> + H(Fe <sup>III</sup> ) → H(Fe <sup>II</sup> )	(3.0 ± 0.6) × 10 <sup>8</sup> (2.8 ± 0.6) × 10 <sup>8</sup>	7.0 11.8	p.r.	P.b.k. at 413 nm in N <sub>2</sub> O-satd. soln. contg. 0.25 mol L <sup>-1</sup> pentaerythritol.	75A241

TABLE 2. Rate constants for reactions of aliphatic radicals with organic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
225.106	CH <sub>2</sub> OHĊOHCH <sub>2</sub> OH + H(Fe <sup>III</sup> ) → H(Fe <sup>II</sup> ) (+ CH <sub>2</sub> OHCHOHĊHOH)	(1.3 ± 0.3) × 10 <sup>9</sup>	7.0	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. 10 <sup>-2</sup> mol L <sup>-1</sup> glycerol.	75A241
225.117	CH <sub>3</sub> ĊOHCO <sub>2</sub> <sup>-</sup> + H(Fe <sup>III</sup> ) → H(Fe <sup>II</sup> )	(5.6 ± 1.1) × 10 <sup>8</sup>	7.0	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. 0.025 mol L <sup>-1</sup> lactate.	75A241
225.121	O <sub>2</sub> CCHOHĊOHCO <sub>2</sub> <sup>-</sup> + H(Fe <sup>III</sup> ) → H(Fe <sup>II</sup> )	(8.1 ± 1.6) × 10 <sup>7</sup>	7.0	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. 0.02 mol L <sup>-1</sup> tartrate.	75A241
225.147	·CO <sub>2</sub> <sup>-</sup> + H(Fe <sup>III</sup> ) → H(Fe <sup>II</sup> )	(1.3 ± 0.3) × 10 <sup>9</sup>	7.0	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. 0.02 mol L <sup>-1</sup> formate.	75A241
226.	<b>Hemoglobin</b>					
226.075	·CH <sub>2</sub> OH + H(Fe <sup>III</sup> ) → H(Fe <sup>II</sup> )	(9.5 ± 1.5) × 10 <sup>6</sup>	7	p.r.	Abs. change at 550 and 435 nm in N <sub>2</sub> O-satd. soln. contg. MeOH; 100% redn.	79A153
226.076	CH <sub>3</sub> ĊHOH + H(Fe <sup>III</sup> ) → H(Fe <sup>II</sup> )	(4.0 ± 0.4) × 10 <sup>7</sup>	7	p.r.	Abs. change at 550 and 435 nm in N <sub>2</sub> O-satd. soln. contg. EtOH; 100% redn.	79A153
227.	<b>Hydroquinone</b>					
227.016	·CH <sub>2</sub> C(CH <sub>3</sub> ) <sub>2</sub> OH + HOC <sub>6</sub> H <sub>4</sub> OH → (CH <sub>3</sub> ) <sub>3</sub> COH + OC <sub>6</sub> H <sub>4</sub> ·	<2 × 10 <sup>6</sup>	11.5	p.r.	Semiquinone not formed in <i>tert</i> -BuOH soln.	79A051
227.020	·CH <sub>2</sub> CHO + HOC <sub>6</sub> H <sub>4</sub> O <sup>-</sup> → CH <sub>3</sub> CHO + ·OC <sub>6</sub> H <sub>4</sub> O <sup>-</sup>	(2.2 ± 0.1) × 10 <sup>9</sup>	~11.5	p.r.	Soln. contg. N <sub>2</sub> O and ethylene glycol or 2-methoxy- or 2-ethoxy- ethanol.	79A051
227.021	·CH <sub>2</sub> CHO + HOC <sub>6</sub> H <sub>4</sub> OH	<2 × 10 <sup>6</sup>	7.2	p.r.	Radical from 2-chloroethanol.	79A051
227.023	CH <sub>3</sub> ĊHCHO + HOC <sub>6</sub> H <sub>4</sub> O <sup>-</sup>	(1.2 ± 0.1) × 10 <sup>9</sup>	~11.5	p.r.	P.b.k. at 430 nm (semiquinone) in N <sub>2</sub> O-satd. soln. contg.	79A051
227.024	CH <sub>3</sub> COĊH <sub>2</sub> CH <sub>3</sub> + HOC <sub>6</sub> H <sub>4</sub> O <sup>-</sup>	(5.6 ± 0.5) × 10 <sup>8</sup>	~11.5	p.r.	1,2-propanediol; radical mixture. P.b.k. at 430 nm in N <sub>2</sub> O-satd. soln. contg. 2,3-butanediol.	79A051
227.025	-(CH <sub>2</sub> ) <sub>4</sub> ĊHCO- + HOC <sub>6</sub> H <sub>4</sub> O <sup>-</sup>	(5.5 ± 1.9) × 10 <sup>8</sup>	~11.5	p.r.	P.b.k. at 430 nm in N <sub>2</sub> O-satd. soln. contg. 1,2-cyclohexanediol.	79A051
227.026	HOCH <sub>2</sub> ĊHCHO + HOC <sub>6</sub> H <sub>4</sub> O <sup>-</sup> (and HOCH <sub>2</sub> COĊH <sub>2</sub> )	(1.3 ± 0.1) × 10 <sup>9</sup>	~11.5	p.r.	P.b.k. at 430 nm in N <sub>2</sub> O-satd. soln. contg. 2,3-epoxypropanol; radical also obtained from glycerol, $k = (1.5 ± 0.1) × 10^9$ and glycerol 2-phosphate, $k =$ (1.7 ± 0.2) × 10 <sup>9</sup> .	79A051
227.027	HOCH <sub>2</sub> CH <sub>2</sub> COĊH <sub>2</sub> + HOC <sub>6</sub> H <sub>4</sub> O <sup>-</sup>	(6.2 ± 0.8) × 10 <sup>8</sup>	~11.5	p.r.	P.b.k. at 430 nm in N <sub>2</sub> O-satd. soln. contg. 2-hydroxyfuran.	79A051
227.028	HO(CH <sub>2</sub> ) <sub>3</sub> ĊHCHO + HOC <sub>6</sub> H <sub>4</sub> O <sup>-</sup>	(8.6 ± 1.2) × 10 <sup>8</sup>	~11.5	p.r.	P.b.k. at 430 nm in N <sub>2</sub> O-satd. soln. contg. 2-(hydroxymethyl)furan.	79A051
227.029	HO(CH <sub>2</sub> ) <sub>4</sub> ĊHCHO + HOC <sub>6</sub> H <sub>4</sub> O <sup>-</sup>	(5.2 ± 0.9) × 10 <sup>8</sup>	~11.5	p.r.	P.b.k. at 430 nm in N <sub>2</sub> O-satd. soln. contg. 2-(hydroxymethyl)pyran.	79A051
227.030	R + HOC <sub>6</sub> H <sub>4</sub> O <sup>-</sup> (R = Radicals from erythritol)	(1.3 ± 0.3) × 10 <sup>9</sup>	~11.5	p.r.	P.b.k. at 430 nm in N <sub>2</sub> O-satd. soln. contg. <i>meso</i> -erythritol.	79A051
227.031	R + HOC <sub>6</sub> H <sub>4</sub> O <sup>-</sup> (R = Radicals from xylitol)	(1.2 ± 0.1) × 10 <sup>9</sup>	~11.5	p.r.	P.b.k. at 430 nm in N <sub>2</sub> O-satd. soln. contg. xylitol.	79A051
227.032	-(CHOH) <sub>3</sub> CH <sub>2</sub> ĊHCO- + HOC <sub>6</sub> H <sub>4</sub> O <sup>-</sup>	(6.4 ± 1.1) × 10 <sup>8</sup>	~11.5	p.r.	P.b.k. at 430 nm in N <sub>2</sub> O-satd. soln. contg. <i>meso</i> -inositol.	79A051
227.033	R + HOC <sub>6</sub> H <sub>4</sub> O <sup>-</sup> (R = Radicals from sorbitol)	(9.8 ± 1.3) × 10 <sup>8</sup>	~11.5	p.r.	P.b.k. at 430 nm in N <sub>2</sub> O-satd. soln. contg. sorbitol.	79A051
227.109	R + HOC <sub>6</sub> H <sub>4</sub> O <sup>-</sup> (R = Radicals from ribose)	(9.6 ± 1) × 10 <sup>8</sup>	~11.5	p.r.	P.b.k. at 430 nm in N <sub>2</sub> O-satd. soln. contg. ribose.	79A051
227.111	R + HOC <sub>6</sub> H <sub>4</sub> O <sup>-</sup> (R = Radicals from glucose)	(7.1 ± 0.9) × 10 <sup>8</sup>	~11.5	p.r.	P.b.k. at 430 nm in N <sub>2</sub> O-satd. soln. contg. glucose.	79A051

1-(2-Hydroxyethyl)-2-methyl-5-nitroimidazole See Metronidazole 271.

1-(2-Hydroxy-3-methoxypropyl)-2-nitroimidazole See Misonidazole 272.

TABLE 2. Rate constants for reactions of aliphatic radicals with organic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
228.	<b>2-Hydroxy-1,4-naphthoquinone</b>					
228.042	$R + Q \rightarrow \cdot Q^-$ (R = Radicals from triglycine)	$1.9 \times 10^9$	10	p.r.	P.b.k. at 400 nm in N <sub>2</sub> O-satd. soln. contg. triglycine.	73A104
228.056	$NH_2\dot{C}HCO_2^- + Q \rightarrow \cdot Q^-$	$(3.1 \pm 0.3) \times 10^9$	8.0	p.r.	P.b.k. at 400 nm in N <sub>2</sub> O-satd. soln. contg. glycine.	73A104
228.078	$(CH_3)_2\dot{C}OH + Q \rightarrow \cdot Q^-$	$(3.4 \pm 0.3) \times 10^9$	7.0	p.r.	P.b.k. at 400 nm in N <sub>2</sub> O-satd. soln. contg. 2-PrOH.	73A104
228.097	$CH_3\dot{C}(O)CH_2CO_2^- + Q \rightarrow \cdot Q^-$	$(1.5 \pm 0.2) \times 10^9$	9.2	p.r.	P.b.k. at 400 nm in Ar-satd. soln. contg. acetoacetate ion and <i>tert</i> -BuOH.	73A104
228.115	$\cdot CHO HCO_2^- + Q \rightarrow \cdot Q^-$	$(9.1 \pm 0.9) \times 10^8$	7.0	p.r.	P.b.k. at 400 nm in N <sub>2</sub> O-satd. soln. contg. glycolate.	73A104
228.147	$\cdot CO_2^- + Q \rightarrow \cdot Q^-$	$(1.95 \pm 0.2) \times 10^9$	7.0	p.r.	P.b.k. at 400 nm in N <sub>2</sub> O-satd. soln. contg. formate.	73A104
229.	<b>3-Hydroxy-2-nitrobenzoate ion</b>					
229.078	$(CH_3)_2\dot{C}OH + ^-O_2CC_6H_3(OH)NO_2 \rightarrow$ $(CH_3)_2CO + H^+ + ^-O_2CC_6H_3(OH)NO_2^-$	$3.3 \times 10^8$	7	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> 2-PrOH.	76A020
230.	<b>3-Hydroxypropionitrile</b>					
230.001	$\cdot CH_3 + CNCH_2CH_2OH \rightarrow$ $CH_4 + CNCH_2\dot{C}HOH$	$< 1.6 \times 10^3$	~1	chem.	Radical from dimethyl sulfoxide in Ti <sup>III</sup> -H <sub>2</sub> O <sub>2</sub> soln.; est from esr meas. and values for competing reactions.	75D188
<i>4-Hydroxy-2,2,6,6-tetramethyl-1-piperidinyloxy See Tetramethylhydroxypiperidinyloxy(TMPN) 343.</i>						
231.	<b>Indigo disulfonate</b>					
231.056	$NH_2\dot{C}HCO_2^- + Dye$	$2.8 \times 10^9$	9	p.r.	D.k. at 610 nm in N <sub>2</sub> O-satd. soln. contg. glycine; 71% <i>e</i> -transfer.	73A078
231.075	$\cdot CH_2OH + Dye$	$2.0 \times 10^9$ $1.9 \times 10^9$	7 9	p.r.	D.k. at 610 nm in N <sub>2</sub> O-satd. soln. contg. MeOH; <i>e</i> -transfer 75% at pH 7 and 62% at pH 9.	73A078
231.078	$(CH_3)_2\dot{C}OH + Dye$	$4.0 \times 10^9$	7,9	p.r.	D.k. at 610 nm in N <sub>2</sub> O-satd. soln. contg. 2-PrOH; 88% <i>e</i> -transfer.	73A078
231.147	$\cdot CO_2^- + Dye \rightarrow$ $CO_2 + Dye^-$	$2.0 \times 10^9$ $2.1 \times 10^9$	7.0 7.0	p.r. p.r.	D.k. at 610 nm in N <sub>2</sub> O-satd. soln. contg. formate. P.b.k. at 400 nm.	73A078 73A078
232.	<b>Indigo tetrasulfonate</b>					
232.056	$NH_2\dot{C}HCO_2^- + Dye$	$2.6 \times 10^9$	7.0	p.r.	D.k. at 610 nm in N <sub>2</sub> O-satd. soln. contg. glycine; 78% <i>e</i> -transfer.	73A078
232.075	$\cdot CH_2OH + Dye$	$3.0 \times 10^9$	7	p.r.	D.k. at 610 nm in N <sub>2</sub> O-satd. soln. contg. MeOH; 80% <i>e</i> -transfer.	73A078
232.078	$(CH_3)_2\dot{C}OH + Dye$	$4.2 \times 10^9$	7	p.r.	D.k. at 610 nm in N <sub>2</sub> O-satd. soln. contg. 2-PrOH; 89% <i>e</i> -transfer.	73A078
233.	<b>Indophenol</b>					
233.075	$\cdot CH_2OH + Dye$	$3.1 \times 10^9$	9	p.r.	D.k. at 610 nm in N <sub>2</sub> O-satd. soln. contg. MeOH; 92% <i>e</i> -transfer.	73A078
233.078	$(CH_3)_2\dot{C}OH + Dye$	$4.0 \times 10^9$	9	p.r.	D.k. at 610 nm in N <sub>2</sub> O-satd. soln. contg. 2-PrOH; 86% <i>e</i> -transfer.	73A078
233.147	$\cdot CO_2^- + Dye \rightarrow$ $CO_2 + Dye^-$	$2.8 \times 10^9$ $2.7 \times 10^9$	9.0 9.0	p.r. p.r.	D.k. at 610 nm in N <sub>2</sub> O-satd. soln. contg. formate. P.b.k. at ~400 nm.	73A078 73A078
233a.	<b>Zinc(II) Insulin</b>					
233a.147	$\cdot CO_2^- + Zn(II)Insulin$	$6 \times 10^8$	9.0	p.r.	P.b.k. at 420 nm in N <sub>2</sub> O-satd. soln. contg. 10 <sup>-2</sup> mol L <sup>-1</sup> formate; based on monomer concn.	80A204

TABLE 2. Rate constants for reactions of aliphatic radicals with organic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
234. 234.078	<b>Iodoacetamide</b> (CH <sub>3</sub> ) <sub>2</sub> ĊOH + ICH <sub>2</sub> CONH <sub>2</sub>	4 x 10 <sup>8</sup> (rel.)		p.r.	C.k. with <i>p</i> -nitroacetophenone in soln. contg. 2-PrOH and acetone; rel. to $k(R + PNAP) = 3.8 \times 10^9$ .	73A140
235. 235.078	<b>Iodoacetate ion</b> (CH <sub>3</sub> ) <sub>2</sub> ĊOH + ICH <sub>2</sub> CO <sub>2</sub> <sup>-</sup>	7 x 10 <sup>7</sup> (rel.)		p.r.	C.k. with <i>p</i> -nitroacetophenone in soln. contg. 2-PrOH and acetone; rel. to $k(R + PNAP) = 3.8 \times 10^9$ .	73A140
236. 236.016	<b>Iodoacetic acid</b> ·CH <sub>2</sub> C(CH <sub>3</sub> ) <sub>2</sub> OH + ICH <sub>2</sub> CO <sub>2</sub> H → ICH <sub>2</sub> C(CH <sub>3</sub> ) <sub>2</sub> OH + ·CH <sub>2</sub> CO <sub>2</sub> H	(1.3 ± 0.3) x 10 <sup>7</sup> (rel.)	1	chem.	Est. from esr meas. in Ti <sup>III</sup> -H <sub>2</sub> O <sub>2</sub> soln. contg. <i>tert</i> -BuOH; rel. to $2k(\text{·CH}_2\text{CO}_2\text{H} + \text{·CH}_2\text{CO}_2\text{H}) = 1.8 \times 10^9$ .	74D286
236.075	·CH <sub>2</sub> OH + ICH <sub>2</sub> CO <sub>2</sub> H → ·CH <sub>2</sub> CO <sub>2</sub> H + prod.	(2.1 ± 0.7) x 10 <sup>8</sup> (rel.)	1	chem.	Est. from esr meas. in Ti <sup>III</sup> -H <sub>2</sub> O <sub>2</sub> soln. contg. MeOH; rel. to $2k(\text{·CH}_2\text{CO}_2\text{H} + \text{·CH}_2\text{CO}_2\text{H}) = 1.8 \times 10^9$ .	74D286
		<3.5 x 10 <sup>8</sup>		p.r.	P.b.k. at 330 nm.	74D286
237. 237.016	<b>Iodoacetonitrile</b> ·CH <sub>2</sub> C(CH <sub>3</sub> ) <sub>2</sub> OH + ICH <sub>2</sub> CN → ICH <sub>2</sub> C(CH <sub>3</sub> ) <sub>2</sub> OH + ·CH <sub>2</sub> CN	2.0 x 10 <sup>7</sup> (rel.)	1	chem.	Est. from esr meas. in Ti <sup>III</sup> -H <sub>2</sub> O <sub>2</sub> soln. contg. <i>tert</i> -BuOH; rel. to $2k(\text{·CH}_2\text{CN} + \text{·CH}_2\text{CN}) = 2 \times 10^9$ .	74D286
238. 238.016	<b>Iodoethanol</b> ·CH <sub>2</sub> C(CH <sub>3</sub> ) <sub>2</sub> OH + ICH <sub>2</sub> CH <sub>2</sub> OH → ICH <sub>2</sub> C(CH <sub>3</sub> ) <sub>2</sub> OH + ·CH <sub>2</sub> CH <sub>2</sub> OH	1.5 x 10 <sup>5</sup> (rel.)	1	chem.	Est. from esr meas in Ti <sup>III</sup> -H <sub>2</sub> O <sub>2</sub> soln. contg. <i>tert</i> -BuOH; rel. to $2k(\text{·CH}_2\text{CH}_2\text{OH} + \text{·CH}_2\text{CH}_2\text{OH}) = 1.9 \times 10^9$ .	74D286
238a. 238a.078	<b>Iodomethane</b> (CH <sub>3</sub> ) <sub>2</sub> ĊO <sup>-</sup> + CH <sub>3</sub> I → ·CH <sub>3</sub> (CH <sub>3</sub> ) <sub>2</sub> ĊOH + CH <sub>3</sub> I	(1.1 ± 0.1) x 10 <sup>8</sup> <10 <sup>5</sup>	~13 7	p.r.	C.k. with PNAP in soln. contg. 6.5 mol L <sup>-1</sup> 2-PrOH and 0.68 mol L <sup>-1</sup> acetone assuming $k = 2.2 \times 10^9$ (279.078).	81A002
239. 239.016	<b>3-Iodopropionic acid</b> ·CH <sub>2</sub> C(CH <sub>3</sub> ) <sub>2</sub> OH + ICH <sub>2</sub> CH <sub>2</sub> CO <sub>2</sub> H → ICH <sub>2</sub> C(CH <sub>3</sub> ) <sub>2</sub> OH + ·CH <sub>2</sub> CH <sub>2</sub> CO <sub>2</sub> H	1.8 x 10 <sup>5</sup> (rel.)	1	chem.	Est. from esr meas. in Ti <sup>III</sup> -H <sub>2</sub> O <sub>2</sub> soln. contg. <i>tert</i> -BuOH; rel. to $2k(\text{·CH}_2\text{CH}_2\text{CO}_2\text{H} + \text{·CH}_2\text{CH}_2\text{CO}_2\text{H}) = 2.4 \times 10^9$ .	74D286
239.075	·CH <sub>2</sub> OH + ICH <sub>2</sub> CH <sub>2</sub> CO <sub>2</sub> H → ·CH <sub>2</sub> CH <sub>2</sub> CO <sub>2</sub> H + prod.	1.0 x 10 <sup>5</sup> (rel.)	1	chem.	Est. from esr meas. in Ti <sup>III</sup> -H <sub>2</sub> O <sub>2</sub> soln. contg. MeOH; rel. to $2k(\text{·CH}_2\text{CH}_2\text{CO}_2\text{H} + \text{·CH}_2\text{CH}_2\text{CO}_2\text{H}) = 2.4 \times 10^9$ .	74D286
240. 240.147	<b>3-Iodotyrosine</b> ·CO <sub>2</sub> <sup>-</sup> + IC <sub>6</sub> H <sub>3</sub> (OH)CH <sub>2</sub> CH <sup>(+)</sup> (NH <sub>3</sub> )CO <sub>2</sub> H → CO <sub>2</sub> + I <sup>-</sup> + ·Ar	(1.3 ± 0.1) x 10 <sup>5</sup>	3.0	X-r.	Est. from dependence of tyrosine yields on irradiation time in soln. contg. 10 <sup>-2</sup> mol L <sup>-1</sup> formate assuming $2k(R + R) = 5.0 \times 10^8$ .	72G610
241. 241.001	<b>Isobutylene</b> ·CH <sub>3</sub> + (CH <sub>3</sub> ) <sub>2</sub> C=CH <sub>2</sub> → addn.	3.9 x 10 <sup>4</sup> (rel.)		γ-r.	C.k. with MeOH in soln. contg. MeI obs. $G(\text{CH}_3)$ ; rel. to $k(\text{·CH}_3 + \text{O}_2) = 4.7 \times 10^9$ .	67G041
242. 242.001	<b>Isobutyric acid</b> ·CH <sub>3</sub> + (CH <sub>3</sub> ) <sub>2</sub> CHCO <sub>2</sub> H → CH <sub>4</sub> + (CH <sub>3</sub> ) <sub>2</sub> ĊCO <sub>2</sub> H	9.0 x 10 <sup>3</sup> (rel.)	~1	chem.	Radical from dimethyl sulfoxide in Ti <sup>III</sup> -H <sub>2</sub> O <sub>2</sub> -soln.; est. from esr meas. and values for competing reactions.	75D188

TABLE 2. Rate constants for reactions of aliphatic radicals with organic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
243.	<b>Isobutyronitrile</b>					
243.001	$\cdot\text{CH}_3 + (\text{CH}_3)_2\text{CHCN} \rightarrow$ $\text{CH}_4 + (\text{CH}_3)_2\dot{\text{C}}\text{CN}$	$4.5 \times 10^3$ (rel.)	~1	chem.	Radical from dimethyl sulfoxide in Ti <sup>III</sup> -H <sub>2</sub> O <sub>2</sub> -soln.; est. from esr meas. and values for competing reactions.	75D188
244.	<b>Isonicotinamide</b>					
244.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{NH}^+ \rightarrow$ $(\text{CH}_3)_2\text{CO} + \text{H}^+ + \cdot\text{NH}$	$(3.1 \pm 0.6) \times 10^9$	0.7	p.r.	P.b.k. (pyridinyl radical) in N <sub>2</sub> O-satd. soln. contg. 2-PrOH.	74A089
245.	<b>Isonicotinic acid</b>					
245.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{H}^+\text{NC}_5\text{H}_4\text{CO}_2\text{H}$ $(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{H}^+\text{NC}_5\text{H}_4\text{CO}_2^-$ $(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{NC}_5\text{H}_4\text{CO}_2^-$ $(\text{CH}_3)_2\dot{\text{C}}\text{O}^- + \text{NC}_5\text{H}_4\text{CO}_2^-$	$2.0 \times 10^9$ $8.5 \times 10^8$ $< 1 \times 10^6$ $2 \times 10^8$	0.4 3.2 9.0 13.3	p.r.	P.b.k. at ~400 nm (pyridinyl radical) in N <sub>2</sub> O-satd. soln. contg. 0.5 mol L <sup>-1</sup> 2-PrOH.	74A106
<i>Isopropanol See 2-Propanol 314.</i>						
246.	<b><math>\alpha</math>-Ketoglutarate ion</b>					
246.113	$\cdot\text{A}^- + \cdot\text{O}_2\text{CCH}_2\text{CH}_2\text{COCO}_2^-$ ( $\cdot\text{A}^-$ = ascorbate radical)	<10	9.7	p.r.	D.k. at 360 nm in N <sub>2</sub> O-satd. soln. contg. ascorbate ion.	75A240
247.	<b>Lactate ion</b>					
247.113	$\cdot\text{A}^- + \text{CH}_3\text{CHOHCO}_2^-$ ( $\cdot\text{A}^-$ = ascorbate radical)	<10	8.6	p.r.	D.k. at 360 nm in N <sub>2</sub> O-satd. soln. contg. ascorbate ion	75A240
248.	<b>Lactic acid</b>					
248.001	$\cdot\text{CH}_3 + \text{CH}_3\text{CHOHCO}_2\text{H} \rightarrow$ $\text{CH}_4 + \text{CH}_3\dot{\text{C}}\text{OHCO}_2\text{H}$	$1.2 \times 10^4$	~1	chem.	Radical from dimethyl sulfoxide in Ti <sup>III</sup> -H <sub>2</sub> O <sub>2</sub> soln.; est. from esr meas. and values for competing reactions.	75D188
249.	<b>Lipoate ion</b>					
249.076	$\text{CH}_3\dot{\text{C}}\text{HOH} + \text{RSSR} \rightarrow$ $(\text{RSSR})^- + \text{CH}_3\text{CHO} + \text{H}^+$	$1.0 \times 10^8$	7	p.r.	P.b.k. at 410 nm in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> EtOH.	70G560
249.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{RSSR} \rightarrow$ $(\text{RSSR})^- + (\text{CH}_3)_2\text{CO} + \text{H}^+$	$1.8 \times 10^8$	7	p.r.	P.b.k. at 410 nm in soln. contg. 1 mol L <sup>-1</sup> acetone and 2-PrOH.	70G560
249.147	$\cdot\text{CO}_2^- + \text{RSSR} \rightarrow$ $(\text{RSSR})^- + \text{CO}_2$	$5.5 \times 10^8$ $5.6 \times 10^8$	7 6.1-9.2	p.r. p.r.	P.b.k. at 410 nm in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> formate ion. P.b.k. at 410 nm; $k = 9 \times 10^8$ at pH 3.	70G560 75A195
RSSR = -SCH <sub>2</sub> CH <sub>2</sub> CH[(CH <sub>2</sub> ) <sub>4</sub> CO <sub>2</sub> ] <sup>-</sup> S-						
250.	<b>Lumazine</b>					
250.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{LH}_2 \rightarrow$ $(\text{CH}_3)_2\text{CO} + \text{LH}_3^+$ $(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{LH}^- \rightarrow$ $(\text{CH}_3)_2\text{CO} + \text{LH}_2^-$ $(\text{CH}_3)_2\dot{\text{C}}\text{O}^- + \text{L}^{2-} \rightarrow$ $(\text{CH}_3)_2\text{CO} + \text{LH}^{2-}$	$(1.3 \pm 0.1) \times 10^9$ $(1.7 \pm 0.2) \times 10^8$ (uncor.) $(1.0 \pm 0.2) \times 10^9$ (uncor.)	0.8, 5.1 9.5 14.0	p.r.	P.b.k. in N <sub>2</sub> O-satd. solns. of 1-2 mol L <sup>-1</sup> 2-PrOH; 100%, 70% and 85% <i>e</i> -transfer at acid pH and pH 9.5 and 14.0, resp.	75A056
251.	<b>Lysozyme</b>					
251.147	$\cdot\text{CO}_2^- + \text{lys} \rightarrow$ $\text{CO}_2 + (-\text{SS})^-$	$\sim 5 \times 10^8$	~6	p.r.	P.b.k. at 420 nm in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> formate and $2 \times 10^{-4}$ mol L <sup>-1</sup> lysozyme; value from graph; $k$ pH-dependent.	75A080
252.	<b>Maleic acid</b>					
252.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{HO}_2\text{CCH}=\text{CHCO}_2\text{H}$	$2.2 \times 10^8$ (uncor.)	0.5	p.r.	18% <i>e</i> -transfer; no <i>e</i> -transfer at pH 10.0 (dianion).	73G097
252.147	$\cdot\text{CO}_2^- + \text{HO}_2\text{CCH}=\text{CHCO}_2^-$	$1.1 \times 10^8$ (uncor.)	5.2	p.r.	$\geq 65\%$ <i>e</i> -transfer; no <i>e</i> -transfer at pH 10.5 (dianion).	73G097
<i>Menaquinone See 2-Methylnaphthoquinone 262.</i>						

TABLE 2. Rate constants for reactions of aliphatic radicals with organic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
253.	<b>2-Mercaptoethanol</b>					
253.014	$\cdot\text{CH}_2\text{CH}_2\text{OH} + \text{HO}(\text{CH}_2)_2\text{SH} \rightarrow$ $\text{CH}_3\text{CH}_2\text{OH} + \text{HO}(\text{CH}_2)_2\text{S}\cdot$	$(4.7 \pm 0.7) \times 10^7$	10	p.r.	P.b.k. (RSSR <sup>-</sup> ) in Ar-satd. soln.; radical from $e_{\text{aq}}^- + \text{HO}(\text{CH}_2)_2\text{SH}$ .	69G553
253.016	$\cdot\text{CH}_2\text{C}(\text{CH}_3)_2\text{OH} + \text{HO}(\text{CH}_2)_2\text{SH} \rightarrow$ $(\text{CH}_3)_3\text{COH} + \text{HO}(\text{CH}_2)_2\text{S}\cdot$	$(8.2 \pm 1.2) \times 10^7$	10	p.r.	P.b.k. at 420 nm (RSSR <sup>-</sup> ) in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> <i>tert</i> -BuOH.	69G553
253.075	$\cdot\text{CH}_2\text{OH} + \text{HO}(\text{CH}_2)_2\text{SH} \rightarrow$ $\text{CH}_3\text{OH} + \text{HO}(\text{CH}_2)_2\text{S}\cdot$	$(1.3 \pm 0.2) \times 10^8$	10	p.r.	P.b.k. (RSSR <sup>-</sup> ) in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> MeOH.	69G553
253.076	$\text{CH}_3\dot{\text{C}}\text{HOH} + \text{HO}(\text{CH}_2)_2\text{SH} \rightarrow$ $\text{CH}_3\text{CH}_2\text{OH} + \text{HO}(\text{CH}_2)_2\text{S}\cdot$	$(2.3 \pm 0.3) \times 10^8$	10	p.r.	P.b.k. (RSSR <sup>-</sup> ) in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> EtOH.	69G553
253.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{HO}(\text{CH}_2)_2\text{SH} \rightarrow$ $(\text{CH}_3)_2\text{CHOH} + \text{HO}(\text{CH}_2)_2\text{S}\cdot$	$(5.1 \pm 0.8) \times 10^8$	10	p.r.	P.b.k. (RSSR <sup>-</sup> ) in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> 2-PrOH.	69G553
253a.	<b>3-Mercaptopropionate ion</b>					
253a.142	$\text{R} + \text{HSCH}_2\text{CH}_2\text{CO}_2^- \rightarrow e^-$ -transfer (R = Electron adduct of glycine anhydride)	$(3.0 \pm 0.3) \times 10^8$	5.3,	p.r.	D.k. at 265 nm in soln. contg. 1 mol L <sup>-1</sup> <i>tert</i> -BuOH.	71G554
254.	<b>Methanethiol</b>					
254.001	$\cdot\text{CH}_3 + \text{CH}_3\text{SH} \rightarrow \text{CH}_4 + \text{CH}_3\text{S}\cdot$	$(7.4 \pm 1) \times 10^7$	11	p.r.	P.b.k. (RSSR <sup>-</sup> ) in Ar-satd. soln.; radical from $e_{\text{aq}}^-$ reaction with CH <sub>3</sub> SH.	69G553
255.	<b>Methanol</b>					
255.001	$\cdot\text{CH}_3 + \text{CH}_3\text{OH} \rightarrow \text{CH}_4 + \cdot\text{CH}_2\text{OH}$	$2.2 \times 10^2$ (rel.)		$\gamma$ -r.	C.k. with O <sub>2</sub> ; radical from MeI; rel. to $k(\text{CH}_3 + \text{O}_2) = 4.7 \times 10^9$ .	67G041
		$\geq 1 \times 10^2$	1	phot.	Radical from Co(NH <sub>3</sub> ) <sub>5</sub> O <sub>2</sub> CCH <sub>3</sub> <sup>2+</sup> ; est. from effect of addn. of MeOH on CH <sub>4</sub> and C <sub>2</sub> H <sub>6</sub> yields.	71F579
255.047	$\cdot\text{CF}_3 + \text{CH}_3\text{OH} \rightarrow \text{CF}_3\text{H} + \cdot\text{CH}_2\text{OH}$	$(8.1 \pm 1.2) \times 10^3$ (rel.)	9-10	$\gamma$ -r.	C.k. with addn. of $\cdot\text{CF}_3$ to propylene; obs. $G(\text{CF}_3\text{H})$ ; rel. to $k(\text{CF}_3 + \text{HCO}_2^-) = 3.4 \times 10^5$ .	70G407
255.113	$\cdot\text{A}^- + \text{CH}_3\text{OH}$ ( $\cdot\text{A}^-$ = ascorbate radical)	<0.1	8.8	p.r.	D.k. at 360 nm in N <sub>2</sub> O-satd. soln. contg. ascorbate ion.	75A240
256.	<b>Methemerythrin</b>					
256.147	$\cdot\text{CO}_2^- + \text{MFe}^{3+}$	$6.8 \times 10^7$	8.2	p.r.	D.k. at 360 nm in N <sub>2</sub> O-satd. soln. contg. 10 <sup>-2</sup> mol L <sup>-1</sup> formate; $I = 0.03$ .	79A204
257.	<b>3-Methoxy-2-nitrotoluene</b>					
257.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{ArNO}_2 \rightarrow$ $(\text{CH}_3)_2\text{CO} + \text{Ar}\dot{\text{N}}\text{O}_2^-$	$2.3 \times 10^8$	7	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> 2-PrOH.	76A020
258.	<b>4-Methoxyphenoxide ion</b>					
258.020	$\cdot\text{CH}_2\text{CHO} + \text{CH}_3\text{OC}_6\text{H}_4\text{O}^- (+ \text{H}_2\text{O}) \rightarrow$ $\text{CH}_3\text{CHO} + \text{CH}_3\text{C}_6\text{H}_4\text{O}\cdot + \text{OH}^-$	$9.8 \times 10^8$	~11.5	p.r.	Soln. contg. N <sub>2</sub> O and ethylene glycol.	79A051
259.	<b>2-Methylbenzoquinone</b>					
259.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{Q} \rightarrow$ $(\text{CH}_3)_2\text{CO} + \text{H}^+ + \cdot\text{Q}^-$	$3.5 \times 10^9$	7	p.r.	P.b.k. in soln. contg. 1 mol L <sup>-1</sup> 2-PrOH and 1 mol L <sup>-1</sup> acetone.	73G125
260.	<b>Methylene blue</b>					
260.056	$\text{NH}_2\dot{\text{C}}\text{HCO}_2^- + \text{MB}^+$	$3.7 \times 10^9$	7	p.r.	D.k. at 580 nm in N <sub>2</sub> O-satd. soln. contg. glycine; 86% $e^-$ -transfer.	73A078
260.075	$\cdot\text{CH}_2\text{OH} + \text{MB}^+$	$3.4 \times 10^9$	7	p.r.	D.k. at 580 nm in N <sub>2</sub> O-satd. soln. contg. MeOH; 91% $e^-$ -transfer.	73A078
260.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{MB}^+$	$(4 \pm 2) \times 10^9$ $4.4 \times 10^9$	7	p.r. p.r.	D.k. at 580 nm in N <sub>2</sub> O-satd. soln. contg. 2-PrOH; 91% $e^-$ -transfer.	73A150 73A078



TABLE 2. Rate constants for reactions of aliphatic radicals with organic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
260.147	$\cdot\text{CO}_2^- + \text{MB}^+ \rightarrow$ $\text{CO}_2 + \text{MB}\cdot$	$5.6 \times 10^9$	~9	p.r.	D.k. at 580 nm in soln. contg. 0.1 mol L <sup>-1</sup> formate.	65G396
	$\cdot\text{CO}_2\text{H} + \text{MB}^+ \rightarrow$ $\text{CO}_2 + \text{H}^+ + \text{MB}\cdot$	$\sim 2 \times 10^9$	1.75	p.r.	D.k. at 580 nm.	65G396
	$\cdot\text{CO}_2\text{H} + \text{MBH}_2^{2+} \rightarrow$ $\text{CO}_2 + \cdot\text{MBH}_2^+ + \text{H}^+$	$\sim 10^9$	H <sub>0</sub> = -0.8	p.r.	D.k. at 660 nm.	65G396
	$\cdot\text{CO}_2\text{H} + \text{MBH}_2^{3+} \rightarrow$ $\text{CO}_2 + \cdot\text{MBH}_2^{2+} + \text{H}^+$	$\sim 7 \times 10^8$	H <sub>0</sub> = -5.7	p.r.	D.k. at 420 nm.	65G396
261.	<b>1-Methylguanosine</b>					
261.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{MG}^+ \rightarrow$ $(\text{CH}_3)_2\dot{\text{C}}\text{O} + \text{MG}\cdot + \text{H}^+$	$8.0 \times 10^7$	0.5	p.r.	P.b.k.	75A060
	<i>Methyl iodide See Iodomethane 238a.</i>					
	<i>1-Methylisonicotinic acid See 4-Carboxy-1-methylpyridinium ion 154.</i>					
	<i>Methyl mercaptan See Methanethiol 254.</i>					
262.	<b>2-Methyl-1,4-naphthoquinone</b>					
262.011	$\cdot\text{CH}_2\text{CH}_2\text{NH}_2 + \text{Q}$		7.5	p.r.	P.b.k. in soln. contg. ethylamine; 10% <i>e</i> -transfer; see 262.049.	73A047
262.016	$\cdot\text{CH}_2\text{C}(\text{CH}_3)_2\text{OH} + \text{Q}$		7.0, 12.4	p.r.	P.b.k. in soln. contg. 0.05 mol L <sup>-1</sup> <i>tert</i> -BuOH; <5% <i>e</i> -transfer.	73A047
262.034	$\cdot\text{CH}_2\text{CONH}_2$ (or $\text{CH}_3\text{CONH}$ ) $+ \text{Q} \rightarrow \cdot\text{Q}^-$	$(1.1 \pm 0.1) \times 10^9$ (uncor.)	6.0, 10.9	p.r.	P.b.k. at 395 nm in soln. contg. acetamide; ~17% <i>e</i> -transfer.	73A047
262.049	$\text{CH}_3\dot{\text{C}}\text{HNH}_2 + \text{Q} \rightarrow \cdot\text{Q}^-$	$(3.3 \pm 0.3) \times 10^9$ (uncor.)	11.6	p.r.	P.b.k. at 395 nm in soln. contg. ethylamine; 34% <i>e</i> -transfer.	73A047
262.050	$(\text{CH}_3)_2\dot{\text{C}}\text{NH}_2 + \text{Q} \rightarrow \cdot\text{Q}^-$	$(3.6 \pm 0.4) \times 10^9$ (uncor.)	11.4	p.r.	P.b.k. at 395 nm in soln. contg. isopropylamine; 41% <i>e</i> -transfer; 14% <i>e</i> -transfer at pH 9.0.	73A047
262.051	$\text{CH}_3\dot{\text{C}}\text{HN}(\text{C}_6\text{H}_5)_2 + \text{Q} \rightarrow \cdot\text{Q}^-$	$(4.6 \pm 0.5) \times 10^9$ (uncor.)	11.6	p.r.	P.b.k. at 395 nm in soln. contg. triethylamine; 37% <i>e</i> -transfer; ~10% <i>e</i> -transfer at pH 6.	73A047
262.053	$\text{CH}_3\text{CONH}\dot{\text{C}}\text{H}_2 + \text{Q} \rightarrow \cdot\text{Q}^-$	$(2.0 \pm 0.2) \times 10^9$ (uncor.)	6.0, 10.9	p.r.	P.b.k. at 395 nm in soln. contg. <i>N</i> -methylacetamide; 19% <i>e</i> -transfer.	73A047
262.055	$\text{CH}_3\text{CON}(\text{CH}_3)\dot{\text{C}}\text{H}_2 + \text{Q}$		6.0, 10.9	p.r.	11% <i>e</i> -transfer in soln. contg. <i>N,N</i> -dimethylacetamide.	73A047
262.056	$\text{NH}_2\dot{\text{C}}\text{HCO}_2^- + \text{Q} \rightarrow \cdot\text{Q}^-$	$3.8 \times 10^9$ (uncor.)	6.2	p.r.	P.b.k. at 400 nm in N <sub>2</sub> O-satd. soln. contg. glycine; 78% <i>e</i> -transfer.	72R057
		$(5.5 \pm 0.6) \times 10^9$ (uncor.)	5.4	p.r.	P.b.k. at 395 nm in N <sub>2</sub> O-satd. soln. contg. glycine; 71% <i>e</i> -transfer.	73A047
		$(4.0 \pm 0.4) \times 10^9$ (uncor.)	8.0	p.r.	P.b.k. at 395 nm in soln. contg. glycine; 79% <i>e</i> -transfer.	73A047 73A104
262.057	$\text{NH}_3^+\dot{\text{C}}\text{HCONH}_2 + \text{Q} \rightarrow \cdot\text{Q}^-$	$(3.6 \pm 0.4) \times 10^9$ (uncor.)	3.2	p.r.	P.b.k. at 395 nm in soln. contg. glycinamide; 24% <i>e</i> -transfer.	73A047
	$\text{NH}_2\dot{\text{C}}\text{HCONH}_2 + \text{Q}$	$5 \times 10^9$ (uncor.)	8.0	p.r.	P.b.k. at 400 nm in N <sub>2</sub> O-satd. soln. contg. glycinamide; 38% <i>e</i> -transfer.	72R057
		$(5.4 \pm 0.5) \times 10^9$ (uncor.)	10.4	p.r.	P.b.k. at 395 nm in soln. contg. glycinamide; 41% <i>e</i> -transfer.	73A047
262.058	$\text{R} + \text{Q} \rightarrow \cdot\text{Q}^-$ (R = Radicals from glycyglycinamide)	$(8.5 \pm 0.9) \times 10^8$ $(8.5 \pm 0.9) \times 10^8$ (uncor.)	6.8, 11.0	p.r.	P.b.k. at 395 nm in N <sub>2</sub> O-satd. soln. contg. glycyglycinamide; 25% <i>e</i> -transfer at pH 6.8 (16% <i>e</i> -transfer at pH 5.5 and 45% at pH 11.0).	73A047
262.059	$\text{CH}_3\text{NH}\dot{\text{C}}\text{HCO}_2^- + \text{Q} \rightarrow \cdot\text{Q}^-$	$(1.1 \pm 0.1) \times 10^9$ (uncor.)	6.0	p.r.	P.b.k. at 395 nm in N <sub>2</sub> O-satd. soln. contg. sarcosine; 33% <i>e</i> -transfer.	73A047
		$(1.7 \pm 0.2) \times 10^9$ (uncor.)	12.5	p.r.	P.b.k. at 395 nm in N <sub>2</sub> O-satd. soln. contg. sarcosine; 64% <i>e</i> -transfer.	73A047
262.061	$\text{CH}_3\text{CON}(\text{CH}_3)\dot{\text{C}}\text{HCO}_2^- + \text{Q} \rightarrow \cdot\text{Q}^-$	$(1.3 \pm 0.1) \times 10^9$ $(1.0 \pm 0.1) \times 10^9$ (uncor.)	7.0, 12.5	p.r.	P.b.k. at 395 nm in N <sub>2</sub> O-satd. soln. contg. acetylsarcosine; 39% <i>e</i> -transfer at pH 7, 38% at pH 12.5.	73A047

TABLE 2. Rate constants for reactions of aliphatic radicals with organic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
262.062	R + Q → ·Q <sup>-</sup> (R = Radical from glycine anhydride)	(4.0 ± 0.4) × 10 <sup>9</sup> (uncor.)	10.9	p.r.	P.b.k. at 395 nm in N <sub>2</sub> O-satd. soln. contg. glycine anhydride; 88% <i>e</i> -transfer; no <i>e</i> -transfer at pH 6.7.	73A047
		5.0 × 10 <sup>9</sup> (uncor.)	10.9	p.r.	P.b.k. at 400 nm in N <sub>2</sub> O-satd. soln. contg. glycine anhydride; 85% <i>e</i> -transfer; no <i>e</i> -transfer at pH 7.0.	72R057
262.063	R + Q → ·Q <sup>-</sup> (R = Radical from alanine anhydride)	(3.1 ± 0.3) × 10 <sup>9</sup> (uncor.)	10.9	p.r.	P.b.k. at 395 nm in soln. contg. alanine anhydride, 75% <i>e</i> -transfer.	73A047
262.065	R + Q → ·Q <sup>-</sup> (R = Radicals from diglycine)	(1.2 ± 0.1) × 10 <sup>9</sup> (uncor.)	6.6 11.0	p.r.	P.b.k. at 395 nm in N <sub>2</sub> O-satd. soln. contg. diglycine; 19% <i>e</i> -transfer at pH 6.6 and 47% at pH 11.	73A047
262.066	R + Q → ·Q <sup>-</sup> (R = Radicals from glycylsarcosine)	(1.0 ± 0.1) × 10 <sup>9</sup> (uncor.)	10.9	p.r.	P.b.k. at 395 nm in N <sub>2</sub> O-satd. soln. contg. glycylsarcosine; 46% <i>e</i> -transfer (20% at pH 6.8).	73A047
262.067	R + Q → ·Q <sup>-</sup> (R = Radicals from acetyldiglycine)	(3.8 ± 0.4) × 10 <sup>9</sup> (uncor.)	12.3	p.r.	P.b.k. at 395 nm in N <sub>2</sub> O-satd. soln. contg. acetyldiglycine; 55% <i>e</i> -transfer.	73A047
262.068	R + Q → ·Q <sup>-</sup> (R = Radicals from triglycine)	(1.8 ± 0.2) × 10 <sup>9</sup> (uncor.)	7.0	p.r.	P.b.k. at 395 nm in N <sub>2</sub> O-satd. soln. contg. triglycine; 11% <i>e</i> -transfer.	73A047
		(1.9 ± 0.2) × 10 <sup>9</sup> (uncor.)	10	p.r.	P.b.k. at 400 nm in N <sub>2</sub> O-satd. soln. contg. triglycine.	73A104
		(1.8 ± 0.2) × 10 <sup>9</sup> (uncor.)	12.0	p.r.	P.b.k. at 395 nm in N <sub>2</sub> O-satd. soln. contg. triglycine; 77% <i>e</i> -transfer.	73A047
262.069	R + Q → ·Q <sup>-</sup> (R = Radicals from acetyltriglycine)	(3.7 ± 0.4) × 10 <sup>9</sup> (uncor.)	12.5	p.r.	P.b.k. at 395 nm in N <sub>2</sub> O-satd. soln. contg. acetyltriglycine; 50% <i>e</i> -transfer.	73A047
262.070	R + Q → ·Q <sup>-</sup> (R = Radicals from acetyltrialanine)	(2.1 ± 0.2) × 10 <sup>9</sup> (uncor.)	6.9	p.r.	P.b.k. at 395 nm in N <sub>2</sub> O-satd. soln. contg. acetyltrialanine; 18% <i>e</i> -transfer.	73A047
		(2.6 ± 0.3) × 10 <sup>9</sup> (uncor.)	12.3	p.r.	P.b.k. at 395 nm in N <sub>2</sub> O-satd. soln. contg. acetyltrialanine; 47% <i>e</i> -transfer.	73A047
262.071	R + Q → ·Q <sup>-</sup> (R = Radicals from acetyltrisarcosine)	(1.3 ± 0.1) × 10 <sup>9</sup> (uncor.)	12.5	p.r.	P.b.k. at 395 nm in N <sub>2</sub> O-satd. soln. contg. acetyltrisarcosine; 39% <i>e</i> -transfer at pH 12.5 and 7.0.	73A047
262.072	R + Q → ·Q <sup>-</sup> (R = Radicals from acetylserineamide)	(1.5 ± 0.2) × 10 <sup>9</sup> (1.9 ± 0.2) × 10 <sup>9</sup> (uncor.)	6, 9, 11.0	p.r.	P.b.k. at 395 nm in N <sub>2</sub> O-satd. soln. contg. acetylserineamide; 52%, 57%, and 68% <i>e</i> -transfer, resp., at pH 6, 9, and 11.	73A047
262.073	R + Q → ·Q <sup>-</sup> (R = Radicals from acetylasparagine)	(1.5 ± 0.2) × 10 <sup>9</sup> (uncor.)	12.5	p.r.	P.b.k. at 395 nm in N <sub>2</sub> O-satd. soln. contg. acetylasparagine; 39% <i>e</i> -transfer; ~12% <i>e</i> -transfer at pH 3.2 and 6.0.	73A047
262.075	·CH <sub>2</sub> OH + Q → ·Q <sup>-</sup>	(3.7 ± 0.4) × 10 <sup>9</sup>	7.0	p.r.	P.b.k. at 395 nm in 0.5 mol L <sup>-1</sup> MeOH; 88% <i>e</i> -transfer.	73A047
	·CH <sub>2</sub> O <sup>-</sup> + Q → ·Q <sup>-</sup>	(4.4 ± 0.4) × 10 <sup>9</sup>	12.4	p.r.	P.b.k. at 395 nm in soln. contg. 0.5 mol L <sup>-1</sup> MeOH; 92% <i>e</i> -transfer.	73A047
262.076	CH <sub>3</sub> ·CHOH + Q → ·Q <sup>-</sup>	(3.8 ± 0.4) × 10 <sup>9</sup>	7.0	p.r.	P.b.k. at 395 nm in soln. contg. 0.5 mol L <sup>-1</sup> EtOH; 90% <i>e</i> -transfer.	73A047
	CH <sub>3</sub> ·CHO <sup>-</sup> + Q → ·Q <sup>-</sup>	(4.2 ± 0.4) × 10 <sup>9</sup>	12.5	p.r.	P.b.k. at 395 nm in soln. contg. 0.5 mol L <sup>-1</sup> EtOH; 92% <i>e</i> -transfer.	73A047
262.078	(CH <sub>3</sub> ) <sub>2</sub> ·COH + Q → ·Q <sup>-</sup>	6.2 × 10 <sup>9</sup>	6.9	p.r.	P.b.k. at 400 nm in N <sub>2</sub> O-satd. soln. contg. 2-PrOH; 80% <i>e</i> -transfer.	72R057
		(4.2 ± 0.4) × 10 <sup>9</sup>	7	p.r.	P.b.k. in soln. cont. 1 mol L <sup>-1</sup> acetone and 1 mol L <sup>-1</sup> 2-PrOH.	73G125
		(4.1 ± 0.4) × 10 <sup>9</sup>	7.0	p.r.	P.b.k. in soln. contg. 0.5 mol L <sup>-1</sup> 2-PrOH; 91% <i>e</i> -transfer.	73A047
		(4.8 ± 0.5) × 10 <sup>9</sup>	7.0	p.r.	P.b.k. at 400 nm in N <sub>2</sub> O-satd. soln. contg. 2-PrOH.	73A104
		(4.2 ± 0.4) × 10 <sup>9</sup>	12.4	p.r.	P.b.k. in soln. contg. 0.5 mol L <sup>-1</sup> EtOH; 91% <i>e</i> -transfer.	73A047

TABLE 2. Rate constants for reactions of aliphatic radicals with organic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
262.079	CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> ĊHOH + Q → ·Q <sup>-</sup>	(4.1 ± 0.4) × 10 <sup>9</sup> (4.2 ± 0.4) × 10 <sup>9</sup> (uncor.)	7.0 12.7	p.r.	P.b.k. in soln. contg. 0.05 mol L <sup>-1</sup> 1-BuOH; 32.3% (pH 7) and 40% (pH 12.7) <i>e</i> -transfer.	73A047
262.097	CH <sub>3</sub> Ċ(O <sup>-</sup> )CH <sub>2</sub> CO <sub>2</sub> <sup>-</sup> + Q → ·Q <sup>-</sup>	(3.7 ± 0.4) × 10 <sup>9</sup>	9.2	p.r.	P.b.k. at 395 nm in soln. contg. acetoacetate and 1 mol L <sup>-1</sup> <i>tert</i> -BuOH; 95% <i>e</i> -transfer.	73A047 73A104
262.108	R + Q → ·Q <sup>-</sup> (R = Radicals from deoxyribose)	4 × 10 <sup>9</sup> (uncor.)	6.8	p.r.	P.b.k. at 400 nm in soln. contg. deoxyribose; 74% <i>e</i> -transfer.	72R057
		(2.1 ± 0.2) × 10 <sup>9</sup> (uncor.)	6.8	p.r.	P.b.k. in soln. contg. 0.05 mol L <sup>-1</sup> deoxyribose; 81% <i>e</i> -transfer.	73A047
262.109	R + Q → ·Q <sup>-</sup> (R = Radicals from ribose)	2.6 × 10 <sup>9</sup> (uncor.)	6.9	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. ribose; 44% <i>e</i> -transfer.	72R057
		(1.4 ± 0.1) × 10 <sup>9</sup> (uncor.)	6.9	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. 0.5 mol L <sup>-1</sup> ribose; 60% <i>e</i> -transfer.	73A047
262.110	R + Q → Q <sup>-</sup> (R = Radicals from ribose phosphate)	4.0 × 10 <sup>9</sup> (uncor.)	6.8	p.r.	P.b.k. at 400 nm in N <sub>2</sub> O-satd. soln. contg. ribose-5-phosphate; 25% <i>e</i> -transfer.	72R057
262.113	·A <sup>-</sup> + Q → ·Q <sup>-</sup> (·A <sup>-</sup> = Radical from ascorbate)	~1.3 × 10 <sup>9</sup> (3.8 ± 0.4) × 10 <sup>9</sup> (uncor.)	3.3 9.0	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. 0.05 mol L <sup>-1</sup> ascorbic acid; 43 and 38% <i>e</i> -transfer, resp., at pH 3.3 and 9.0.	73A047
262.114	ĊHO·CONH <sub>2</sub> + Q → ·Q <sup>-</sup>	(2.3 ± 0.2) × 10 <sup>9</sup> (uncor.)	7.1	p.r.	P.b.k. at 395 nm in N <sub>2</sub> O-satd. soln. contg. glycolamide; 48% <i>e</i> -transfer.	73A047
262.115	ĊHOHCO <sub>2</sub> H + Q → ·Q <sup>-</sup>	(9.2 ± 0.9) × 10 <sup>8</sup> (uncor.)	3.2	p.r.	P.b.k. at 395 nm in N <sub>2</sub> O-satd. soln. contg. glycolic acid; 13% <i>e</i> -transfer.	73A047
	ĊHOHCO <sub>2</sub> <sup>-</sup> + Q → ·Q <sup>-</sup>	(1.5 ± 0.2) × 10 <sup>9</sup> (uncor.)	6.5	p.r.	P.b.k. at 395 nm in N <sub>2</sub> O-satd. soln. contg. glycolate ion; 69% <i>e</i> -transfer.	73A047 73A104
	ĊHO·CO <sub>2</sub> <sup>-</sup> + Q → ·Q <sup>-</sup>	(1.6 ± 0.2) × 10 <sup>9</sup> (uncor.)	10.6	p.r.	P.b.k. at 395 nm in N <sub>2</sub> O-satd. soln. contg. glycolate ion; 77% <i>e</i> -transfer.	73A047
262.117	CH <sub>3</sub> ĊOHCO <sub>2</sub> <sup>-</sup> + Q → ·Q <sup>-</sup>	(1.4 ± 0.1) × 10 <sup>9</sup> (uncor.)	6.5	p.r.	P.b.k. at 395 nm in N <sub>2</sub> O-satd. soln. contg. lactate ion; 55% <i>e</i> -transfer.	73A047
	CH <sub>3</sub> Ċ(O <sup>-</sup> )CO <sub>2</sub> <sup>-</sup> + Q → ·Q <sup>-</sup>	(1.9 ± 0.2) × 10 <sup>9</sup> (uncor.)	10.6	p.r.	P.b.k. at 395 nm in N <sub>2</sub> O-satd. soln. contg. lactate ion; 72% <i>e</i> -transfer (15% at pH 3.2).	73A047
262.118	CH <sub>3</sub> Ċ(O <sup>-</sup> )CO <sub>2</sub> CH <sub>3</sub> + Q → ·Q <sup>-</sup>	(2.3 ± 0.2) × 10 <sup>9</sup> (uncor.)	10.4	p.r.	P.b.k. at 395 nm in N <sub>2</sub> O-satd. soln. contg. methyl lactate; 74% <i>e</i> -transfer (20% at pH 3.2).	73A047
262.119	ĊO <sup>-</sup> (CO <sub>2</sub> ) <sub>2</sub> + Q → ·Q <sup>-</sup>	(2.5 ± 0.3) × 10 <sup>9</sup>	9.2	p.r.	P.b.k. at 395 nm in soln. contg. ketomalonate and 1 mol L <sup>-1</sup> <i>tert</i> -BuOH; 94% <i>e</i> -transfer.	73A047
262.120	·O <sub>2</sub> CĊ(OH)CH <sub>2</sub> CO <sub>2</sub> <sup>-</sup> + Q → ·Q <sup>-</sup>	(1.1 ± 0.1) × 10 <sup>9</sup> (uncor.)	7.0	p.r.	P.b.k. at 395 nm in N <sub>2</sub> O-satd. soln. contg. malate; 47% <i>e</i> -transfer.	73A047
		(3.1 ± 0.3) × 10 <sup>9</sup>	6.2	p.r.	P.b.k. at 395 nm in soln. contg. oxaloacetate and 1 mol L <sup>-1</sup> <i>tert</i> -BuOH; 92% <i>e</i> -transfer.	73A047
262.121	HO <sub>2</sub> CCHOHĊ(OH)CO <sub>2</sub> H + Q → ·Q <sup>-</sup>	(7.0 ± 0.7) × 10 <sup>8</sup> (uncor.)	3.2	p.r.	P.b.k. at 395 nm in N <sub>2</sub> O-satd. soln. contg. tartaric acid; 14% <i>e</i> -transfer.	73A047
	·O <sub>2</sub> CCHOHĊ(OH)CO <sub>2</sub> <sup>-</sup> + Q → ·Q <sup>-</sup>	(7.0 ± 0.7) × 10 <sup>8</sup> (uncor.)	11.0	p.r.	P.b.k. at 395 nm in N <sub>2</sub> O-satd. soln. contg. tartrate ion; 69% <i>e</i> -transfer.	73A047
262.122	·O <sub>2</sub> C(CH <sub>2</sub> ) <sub>2</sub> Ċ(O <sup>-</sup> )CO <sub>2</sub> <sup>-</sup> + Q → ·Q <sup>-</sup>	(3.8 ± 0.4) × 10 <sup>9</sup>	10.2	p.r.	P.b.k. at 395 nm in soln. contg. α-ketoglutarate and 1 mol L <sup>-1</sup> <i>tert</i> -BuOH; 94% <i>e</i> -transfer.	73A047
262.142	R + Q → ·Q <sup>-</sup> (R = Electron adduct of glycine anhydride)	(4.9 ± 0.5) × 10 <sup>9</sup>	6.9	p.r.	P.b.k. at 395 nm in soln. contg. glycine anhydride; 98% <i>e</i> -transfer.	73A047
262.143	R + Q → ·Q <sup>-</sup> (R = Electron adduct of alanine anhydride)	(4.8 ± 0.5) × 10 <sup>9</sup>	6.0	p.r.	P.b.k. at 395 nm in soln. contg. alanine anhydride; 92% <i>e</i> -transfer.	73A047
262.144	R + Q → ·Q <sup>-</sup> (R = Electron adduct of sarcosine anhydride)	(4.6 ± 0.5) × 10 <sup>9</sup>	6.0	p.r.	P.b.k. at 395 nm in soln. contg. sarcosine anhydride; 91% <i>e</i> -transfer.	73A047
262.146	R + Q → ·Q <sup>-</sup> (R = Electron adduct of acetylglycylglycinamide)	(2.7 ± 0.3) × 10 <sup>9</sup>	7.0	p.r.	P.b.k. at 395 nm; 99% <i>e</i> -transfer.	73A047

TABLE 2. Rate constants for reactions of aliphatic radicals with organic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
262.147	$\cdot\text{CO}_2^- + \text{Q} \rightarrow \cdot\text{Q}^-$	$5.4 \times 10^9$	6.9	p.r.	P.b.k. at 400 nm in N <sub>2</sub> O-satd. soln. contg. formate; 100% $e$ -transfer.	72R057
		$(4.8 \pm 0.5) \times 10^9$	7	p.r.	P.b.k. at 400 nm in N <sub>2</sub> O-satd. soln. contg. formate.	73A047 73A104
	<i>1-Methylnicotinamide See 3-Carbamoyl-1-methylpyridinium ion 151.</i>					
	<i>1-Methylnicotinate ion See 3-Carboxy-1-methylpyridinium ion 153.</i>					
	<i>3-Methyl-2-nitroanisole See 3-Methoxy-2-nitrotoluene 257.</i>					
263.	<b>3-Methyl-2-nitrobenzoate ion</b>					
263.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{NO}_2\text{B} \rightarrow$ $(\text{CH}_3)_2\text{CO} + \text{H}^+ + \cdot\text{NO}_2\text{B}^{2-}$	$1.9 \times 10^9$	7	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> 2-PrOH.	76A020
264.	<b>2-Methyl-5-nitroimidazole</b>					
264.078	$(\text{CH}_2)_2\dot{\text{C}}\text{OH} + \text{NX} \rightarrow$ $(\text{CH}_3)_2\text{CO} + \text{H}^+ + \text{NX}^-$	$2.5 \times 10^9$		p.r.	P.b.k.	76A075
265.	<b>3-Methyl-2-nitrophenol</b>					
265.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{CH}_3(\text{OH})\text{C}_6\text{H}_3\text{NO}_2 \rightarrow$ $(\text{CH}_3)_2\text{CO} + \text{H}^+ + \text{CH}_3(\text{OH})\text{C}_6\text{H}_3\dot{\text{N}}\text{O}_2^-$	$2.9 \times 10^9$		p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> 2-PrOH.	76A020
266.	<b>4-Methylphenoxide ion</b>					
266.020	$\cdot\text{CH}_2\text{CHO} + \text{CH}_3\text{C}_6\text{H}_4\text{O}^- (+ \text{H}_2\text{O}) \rightarrow$ $\text{CH}_3\text{CHO} + \text{CH}_3\text{C}_6\text{H}_4\text{O}\cdot + \text{OH}^-$	$9.0 \times 10^7$	~11.5	p.r.	Soln. contg. N <sub>2</sub> O and ethylene glycol.	79A051
267.	<b>Methyl propionate</b>					
267.001	$\cdot\text{CH}_3 + \text{C}_2\text{H}_5\text{CO}_2\text{CH}_3 \rightarrow$ $\text{CH}_4 + \text{CH}_3\dot{\text{C}}\text{HCO}_2\text{CH}_3$	$2.9 \times 10^9$ (rel.)	~1	chem.	Radical from dimethyl sulfoxide in Ti <sup>III</sup> -H <sub>2</sub> O <sub>2</sub> -soln.; est. from esr meas. and values of competing reactions.	75D188
268.	<b>3-Methylpterin</b>					
268.075	$\cdot\text{CH}_2\text{OH} + \text{PtH}^+$	$6 \times 10^7$ (uncor.)	0.8	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. MeOH; ~45% $e$ -transfer.	76A060
268.076	$\text{CH}_3\dot{\text{C}}\text{HOH} + \text{Pt}$	$3.2 \times 10^7$ (uncor.)	6.3	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. EtOH; 55% $e$ -transfer.	76A060
268.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{PtH}^+$ $(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{Pt}$	$1.9 \times 10^9$ $2.9 \times 10^8$	0.8 7.0	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. 2-PrOH; 100% $e$ -transfer.	76A060
269.	<b>9-Methylpurine</b>					
269.076	$\text{CH}_3\dot{\text{C}}\text{HOH} + \text{MP} \rightarrow \text{MPH}\cdot$ $\text{CH}_3\dot{\text{C}}\text{HO}^- + \text{MP} \rightarrow \text{MP}^-$	$<2 \times 10^7$ $5.1 \times 10^8$	8.2 13.6	p.r.	P.b.k.; N <sub>2</sub> O-satd. soln. contg. EtOH.	76A060
269.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{MPH}^+ \rightarrow \text{MPH}_3^{2+}$ $(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{MP} \rightarrow \text{MPH}\cdot$ $(\text{CH}_3)_2\dot{\text{C}}\text{O}^- + \text{MP} \rightarrow \text{MP}^-$	$1.9 \times 10^9$ $1.7 \times 10^8$ $8.7 \times 10^8$	~0 8.6 13.6	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. 2-PrOH.	76A060
	<i>1-Methyl-3-pyridinecarboxylate ion See 3-Carboxy-1-methylpyridinium ion 153.</i>					
	<i>1-Methyl-4-pyridinecarboxylate ion See 4-Carboxy-1-methylpyridinium ion 154.</i>					
	<i>Methylviologen See 1,1'-Dimethyl-4,4'-bipyridinium ion 183.</i>					
270.	<b>Metmyoglobin</b>					
270.075	$\cdot\text{CH}_2\text{OH} + \text{M}(\text{Fe}^{\text{III}}) \rightarrow$ $\text{CH}_2\text{O} + \text{H}^+ + \text{M}(\text{Fe}^{\text{II}})$	$(2.4 \pm 0.5) \times 10^7$	7	p.r.	95% redn. of hemoprotein in N <sub>2</sub> O-satd. soln. contg. MeOH; obs. abs. change at 550 and 435 nm.	79A153
270.076	$\text{CH}_3\dot{\text{C}}\text{HOH} + \text{M}(\text{Fe}^{\text{III}})$	$(5.5 \pm 0.5) \times 10^7$	7	p.r.	95% redn. of hemoprotein in N <sub>2</sub> O-satd. soln. contg. EtOH.	79A153
270.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{M}(\text{Fe}^{\text{III}}) \rightarrow \text{M}(\text{Fe}^{\text{II}})$	~ $1 \times 10^8$	7.5	p.r.	$G = 2.2$ .	79A371
270.121	$\cdot\text{O}_2\text{CCHOH}\dot{\text{C}}\text{HOHCO}_2^- + \text{M}(\text{Fe}^{\text{III}})$	$(3.5 \pm 0.7) \times 10^7$	7	p.r.	Redn. in soln. contg. 10 <sup>-2</sup> mol L <sup>-1</sup> tartrate.	78A288

TABLE 2. Rate constants for reactions of aliphatic radicals with organic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
270.147	$\cdot\text{CO}_2^- + \text{M}(\text{Fe}^{\text{III}})$	$(2.0 \pm 0.4) \times 10^9$	7	p.r.	Redn. in soln. contg. $10^{-2}$ mol L <sup>-1</sup> formate.	78A288
		$2.9 \times 10^9$	8.2	p.r.	D.k. at 360 nm in N <sub>2</sub> O-satd. soln. contg. $10^{-2}$ mol L <sup>-1</sup> formate; $I = 0.03$ .	79A204
271.	<b>Metronidazole [1-(2-Hydroxyethyl)-2-methyl-5-nitroimidazole]</b>					
271.075	$\cdot\text{CH}_2\text{OH} + \text{RNO}_2$	$10^8$		p.r.	D.k. at 320 nm in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> MeOH.	74A135
271.076	$\text{CH}_3\dot{\text{C}}\text{HOH} + \text{RNO}_2$	$2 \times 10^8$		p.r.	D.k. at 320 nm in N <sub>2</sub> O-satd. soln. contg. EtOH.	74A135
271.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{RNO}_2$	$7 \times 10^8$		p.r.	D.k. at 320 nm in N <sub>2</sub> O-satd. soln. contg. 2-PrOH.	74A135
271.147	$\cdot\text{CO}_2^- + \text{RNO}_2$	$8 \times 10^8$		p.r.	D.k. at 320 nm in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> formate ion; also c.k. gave $8 \times 10^8$ rel. to $k(\cdot\text{CO}_2^- + \text{TAN}) = 6 \times 10^8$ [342.147].	74A135
272.	<b>Misonidazole [1-(2-Hydroxy-3-methoxypropyl)-2-nitroimidazole]</b>					
272.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{RNO}_2 \rightarrow (\text{CH}_3)_2\text{CO} + \text{H}^+ + \text{RNO}_2^-$	$(2.8 \pm 0.4) \times 10^9$		p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> 2-PrOH.	76A070
273.	<b>1,4-Naphthoquinone</b>					
273.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{Q} \rightarrow \cdot\text{Q}^-$	$3.6 \times 10^9$	7	p.r.	P.b.k. in soln. contg. 1 mol L <sup>-1</sup> 2-PrOH and 1 mol L <sup>-1</sup> acetone.	73G125
274.	<b>1,4-Naphthoquinone-2-sulfonate ion</b>					
274.056	$\text{NH}_2\dot{\text{C}}\text{HCO}_2^- + \text{Q} \rightarrow \cdot\text{Q}^-$	$(3.3 \pm 0.3) \times 10^9$	8.0	p.r.	P.b.k. at 400 nm in N <sub>2</sub> O-satd. soln. contg. glycine.	73A104
274.068	$\text{R} + \text{Q} \rightarrow \cdot\text{Q}^-$ (R = Radicals from triglycine)	$(2.0 \pm 0.2) \times 10^9$	10	p.r.	P.b.k. at 400 nm in N <sub>2</sub> O-satd. soln. contg. triglycine.	73A104
274.115	$\cdot\text{CHOHCO}_2^- + \text{Q} \rightarrow \cdot\text{Q}^-$	$(1.7 \pm 0.2) \times 10^9$	7.0	p.r.	P.b.k. at 400 nm in N <sub>2</sub> O-satd. soln. contg. glycolate ion.	73A104
275.	<b>Nicotinamide</b>					
275.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{NH}^+ \rightarrow (\text{CH}_3)_2\text{CO} + \cdot\text{NH} + \text{H}^+$	$(2.1 \pm 0.4) \times 10^8$	0.9	p.r.	P.b.k.; no e-transfer in neutral soln.	74A089
		$4.0 \times 10^8$	1.9	p.r.	P.b.k. at ~400 nm in N <sub>2</sub> O-satd. soln. contg. 0.5 mol L <sup>-1</sup> 2-PrOH.	74A106
	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{N}$	$<1 \times 10^6$	9.2	p.r.	P.b.k. at ~400 nm in N <sub>2</sub> O-satd. soln. contg. 0.5 mol L <sup>-1</sup> 2-PrOH.	74A106
276.	<b>Nicotinamide-adenine dinucleotide</b>					
276.056	$\text{NH}_2\dot{\text{C}}\text{HCO}_2^- + \text{NAD}^+$	$1.5 \times 10^9$	6.0	p.r.		73A104
276.075	$\cdot\text{CH}_2\text{OH} + \text{NAD}^+$	$1.0 \times 10^9$	6.0	p.r.		73A104
276.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{NAD}^+ \rightarrow (\text{CH}_3)_2\text{CO} + \text{H}^+ + \cdot\text{NAD}$	$1.0 \times 10^9$		p.r.	Est. from buildup and decay of $\cdot\text{NAD}$ at 400 nm in soln. contg. 1 mol L <sup>-1</sup> acetone, 1 mol L <sup>-1</sup> 2-PrOH, $2 \times 10^{-4}$ mol L <sup>-1</sup> O <sub>2</sub> and $2 \times 10^{-5}$ mol L <sup>-1</sup> benzoquinone.	70R013
		$1.0 \times 10^9$	6.0	p.r.		73A104
276.147	$\cdot\text{CO}_2^- + \text{NAD}^+ \rightarrow \text{CO}_2 + \cdot\text{NAD}$	$1.6 \times 10^9$	6.4	p.r.	P.b.k. at 400 nm in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> formate.	68G441
277.	<b>Nicotinic acid</b>					
277.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{H}^+\text{NC}_5\text{H}_4\text{CO}_2\text{H}$	$3.5 \times 10^8$	0.0	p.r.	P.b.k. at ~400 nm (pyridinyl radical) in N <sub>2</sub> O-satd. soln.	74A106
	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{H}^+\text{NC}_5\text{H}_4\text{CO}_2^-$	$1.8 \times 10^8$	3.4			
	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{NC}_5\text{H}_4\text{CO}_2^-$	$<1 \times 10^6$	8.2		contg. 0.5 mol L <sup>-1</sup> 2-PrOH.	
	$(\text{CH}_3)_2\dot{\text{C}}\text{O}^- + \text{NC}_5\text{H}_4\text{CO}_2^-$	$>1 \times 10^8$	13.1			

TABLE 2. Rate constants for reactions of aliphatic radicals with organic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
278.	<b>Nifuroxime [<i>anti</i>-5-Nitro-2-furaldoxime]</b>					
278.018	R + NF (R = Radicals from allyl alcohol)	5.1 x 10 <sup>9</sup> (uncor.)	7	p.r.	P.b.k. at 395 nm (NF <sup>-</sup> ) in N <sub>2</sub> O-satd. soln. contg. allyl alcohol; 3% <i>e</i> -transfer.	73A062 73A099
278.019	R + NF (R = Radicals from crotyl alcohol)	5.6 x 10 <sup>9</sup> (uncor.)	7	p.r.	P.b.k. at 390 nm (NF <sup>-</sup> ) in N <sub>2</sub> O-satd. soln. contg. crotyl alcohol; 24% <i>e</i> -transfer.	73A099
		2.4 x 10 <sup>9</sup> (uncor.)	7	p.r.	P.b.k. at 395 nm in N <sub>2</sub> O-satd. soln. contg. crotyl alcohol; 10% <i>e</i> -transfer.	73A052
278.037	CH <sub>3</sub> ĊHCO <sub>2</sub> <sup>-</sup> + NF	4.0 x 10 <sup>9</sup> (uncor.)	7	p.r.	P.b.k. at 390 nm (NF <sup>-</sup> ) in N <sub>2</sub> O-satd. soln. contg. 0.2 mol L <sup>-1</sup> propionate ion; 2% <i>e</i> -transfer based on abs. spectra.	73A099
278.038	CH <sub>3</sub> CH <sub>2</sub> ĊHCO <sub>2</sub> <sup>-</sup> + NF	4.9 x 10 <sup>9</sup> (uncor.)	7	p.r.	P.b.k. at 390 nm (NF <sup>-</sup> ) in N <sub>2</sub> O-satd. soln. contg. 0.2 mol L <sup>-1</sup> butyrate ion; 2% <i>e</i> -transfer.	73A099
278.039	HOCH <sub>2</sub> ĊHCO <sub>2</sub> <sup>-</sup> + NF	6 x 10 <sup>9</sup> (uncor.)	7	p.r.	P.b.k. at 390 nm in soln. contg. 4 x 10 <sup>-4</sup> mol L <sup>-1</sup> acrylate ion; 65% <i>e</i> -transfer.	73A099
278.040	CH <sub>3</sub> CHOHĊHCO <sub>2</sub> <sup>-</sup> + NF	5.5 x 10 <sup>9</sup> (uncor.)	7	p.r.	P.b.k. at 390 nm in soln. contg. crotonate ion; 25% <i>e</i> -transfer.	73A099
278.041	˙O <sub>2</sub> CĊHCHOHCO <sub>2</sub> <sup>-</sup> + NF	2.4 x 10 <sup>9</sup> (uncor.)	7	p.r.	P.b.k. at 390 nm in soln. contg. maleate ion; 3% <i>e</i> -transfer.	73A099
278.042	˙CH(CO <sub>2</sub> ) <sub>2</sub> + NF	1.3 x 10 <sup>9</sup> (uncor.)	7	p.r.	P.b.k. at 390 nm in N <sub>2</sub> O-satd. soln. contg. 0.2 mol L <sup>-1</sup> malonate ion; 3% <i>e</i> -transfer.	73A099
278.075	˙CH <sub>2</sub> OH + NF → NF <sup>-</sup>	8 x 10 <sup>8</sup>	7	p.r.	P.b.k. at 390 nm in N <sub>2</sub> O-satd. soln. contg. 0.2 mol L <sup>-1</sup> MeOH; 90% <i>e</i> -transfer.	73A099
278.076	CH <sub>3</sub> ĊHOH + NF → NF <sup>-</sup>	> 1.5 x 10 <sup>9</sup> (uncor.)	7	p.r.	P.b.k. at 390 nm in N <sub>2</sub> O-satd. soln. contg. 0.2 mol L <sup>-1</sup> EtOH; > 75% <i>e</i> -transfer.	73A099
278.077	CH <sub>3</sub> CH <sub>2</sub> ĊHOH + NF → NF <sup>-</sup>	3.2 x 10 <sup>9</sup> (uncor.)	7	p.r.	P.b.k. at 390 nm in N <sub>2</sub> O-satd. soln. contg. 1-PrOH; 52% <i>e</i> -transfer.	73A062
		3.2 x 10 <sup>9</sup>	7	p.r.	P.b.k. at 395 nm in N <sub>2</sub> O-satd. soln. contg. 1-PrOH; 95% <i>e</i> -transfer.	73A099
278.078	(CH <sub>3</sub> ) <sub>2</sub> ĊOH + NF → NF <sup>-</sup>	3.3 x 10 <sup>9</sup>	7	p.r.	P.b.k. at 390 nm in N <sub>2</sub> O-satd. soln. contg. 0.2 mol L <sup>-1</sup> 2-PrOH; 100% <i>e</i> -transfer.	73A099
		3.5 x 10 <sup>9</sup>		p.r.	P.b.k.	76A075
278.079	CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> ĊHOH + NF → NF <sup>-</sup>	5.1 x 10 <sup>9</sup> (uncor.)	7	p.r.	P.b.k. at 390 nm in N <sub>2</sub> O-satd. soln. contg. 1-BuOH; 75% <i>e</i> -transfer.	73A099
		3.4 x 10 <sup>9</sup> (uncor.)	7	p.r.	P.b.k. at 395 nm in N <sub>2</sub> O-satd. soln. contg. 1-BuOH; 32% <i>e</i> -transfer.	73A062
278.099	NH <sub>3</sub> <sup>+</sup> CH <sub>2</sub> ĊHOPO <sub>3</sub> <sup>2-</sup> + NF	3.0 x 10 <sup>9</sup> (uncor.)	7	p.r.	P.b.k. at 390 nm in N <sub>2</sub> O-satd. soln. contg. 10 <sup>-2</sup> mol L <sup>-1</sup> <i>o</i> -phosphoryl-ethanolamine; 1% <i>e</i> -transfer.	73A099
278.106	CH <sub>2</sub> OHCHOHĊHOH + NF (+ CH <sub>2</sub> OHĊOHCH <sub>2</sub> OH)	1.3 x 10 <sup>9</sup> (uncor.)	7	p.r.	P.b.k. at 390 nm in N <sub>2</sub> O-satd. soln. contg. 0.2 mol L <sup>-1</sup> glycerol; 20% <i>e</i> -transfer.	73A099
278.108	R + NF → NF <sup>-</sup> (R = Radicals from deoxyribose)	1.4 x 10 <sup>9</sup> (uncor.)	7	p.r.	P.b.k. at 390 nm in N <sub>2</sub> O-satd. soln. contg. 10 <sup>-2</sup> mol L <sup>-1</sup> deoxyribose; 70% <i>e</i> -transfer.	73A099
278.109	R + NF → NF <sup>-</sup> (R = Radicals from ribose)	1.5 x 10 <sup>9</sup> (uncor.)	7	p.r.	P.b.k. at 390 nm in N <sub>2</sub> O-satd. soln. contg. 10 <sup>-2</sup> mol L <sup>-1</sup> ribose; 50% <i>e</i> -transfer.	73A099
278.110	R + NF (R = Radicals from ribose phosphate)	1.7 x 10 <sup>9</sup> (uncor.)	7	p.r.	P.b.k. at 390 nm in N <sub>2</sub> O-satd. soln. contg. 10 <sup>-3</sup> mol L <sup>-1</sup> ribose phosphate; 10% <i>e</i> -transfer.	73A099

TABLE 2. Rate constants for reactions of aliphatic radicals with organic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
278.117	$\text{CH}_3\dot{\text{C}}\text{OHCO}_2^- + \text{NF} \rightarrow \text{NF}^-$	$1.5 \times 10^9$	7	p.r.	P.b.k. at 390 nm in N <sub>2</sub> O-satd. soln. contg. 0.2 mol L <sup>-1</sup> lactate ion; 100% <i>e</i> -transfer.	73A099
278.120	$^{\cdot}\text{O}_2\text{CCH}_2\dot{\text{C}}\text{OHCO}_2^- + \text{NF}$	$1.2 \times 10^8$ (uncor.)	7	p.r.	P.b.k. at 390 nm in N <sub>2</sub> O-satd. soln. contg. 0.2 mol L <sup>-1</sup> malate ion; 30% <i>e</i> -transfer.	73A099
278.147	$^{\cdot}\text{CO}_2^- + \text{NF} \rightarrow \text{NF}^-$	$2.7 \times 10^9$		p.r.	P.b.k. at 390 nm in CO <sub>2</sub> -satd. soln. contg. <i>tert</i> -BuOH or 0.2 mol L <sup>-1</sup> formate; 100% <i>e</i> -transfer.	73A099
279.	<b><i>p</i>-Nitroacetophenone</b>					
279.018	R + PNAP (R = Radicals from allyl alcohol)	$2.7 \times 10^9$ (uncor.)	7	p.r.	P.b.k. at 360 and 550 nm (PNAP <sup>-</sup> ) in N <sub>2</sub> O-satd. soln. contg. allyl alcohol; 3% <i>e</i> -transfer.	73A062
279.019	R + PNAP (R = Radicals from crotyl alcohol)	$2.0 \times 10^9$ (uncor.)	7	p.r.	P.b.k. at 360 and 550 nm (PNAP <sup>-</sup> ) in N <sub>2</sub> O-satd. soln. contg. crotyl alcohol; 9% <i>e</i> -transfer.	73A062
279.075	$^{\cdot}\text{CH}_2\text{OH} + \text{PNAP} \rightarrow \text{addn.}$	$1 \times 10^8$	7	p.r.	P.b.k. at 330 nm in N <sub>2</sub> O-satd. soln. contg. MeOH.	73G122
	$^{\cdot}\text{CH}_2\text{OH} + \text{PNAP} \rightarrow \text{PNAP}^-$	$1 \times 10^7$	7	p.r.	P.b.k. at 550 nm in N <sub>2</sub> O-satd. soln. contg. MeOH.	73G122
	$^{\cdot}\text{CH}_2\text{O}^- + \text{PNAP} \rightarrow \text{PNAP}^-$	$(4.7 \pm 0.5) \times 10^9$	13	p.r.	P.b.k. at 550 nm in N <sub>2</sub> O-satd. soln. contg. MeOH.	73G122
279.076	$\text{CH}_3\dot{\text{C}}\text{HOH} + \text{PNAP} \rightarrow \text{PNAP}^-$	$(8 \pm 2) \times 10^8$	11	p.r.	P.b.k. at 550 nm in N <sub>2</sub> O-satd. soln. contg. EtOH.	73G122
279.077	$\text{CH}_3\text{CH}_2\dot{\text{C}}\text{HOH} + \text{PNAP}$	$2.4 \times 10^9$ (uncor.)	7	p.r.	P.b.k. at 360 and 550 nm in N <sub>2</sub> O-satd. soln. contg. 1-PrOH; 45% <i>e</i> -transfer.	73A062
279.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{PNAP} \rightarrow \text{PNAP}^-$	$(3.8 \pm 0.4) \times 10^9$	11	p.r.	P.b.k. at 550 nm in N <sub>2</sub> O-satd. soln. contg. 2-PrOH.	73G122
		$2.2 \times 10^9$	~13	p.r.	P.b.k. at 355 nm in soln. contg. 6.5 mol L <sup>-1</sup> 2-PrOH and 0.68 mol L <sup>-1</sup> acetone.	81A002
279.079	$\text{CH}_3\text{CH}_2\text{CH}_2\dot{\text{C}}\text{HOH} + \text{PNAP}$	$2.2 \times 10^9$ (uncor.)	7	p.r.	P.b.k. at 360 and 550 nm in N <sub>2</sub> O-satd. soln. contg. 1-BuOH; 24% <i>e</i> -transfer.	73A062
279.108	R + PNAP → PNAP <sup>-</sup> (R = Radicals from deoxyribose)	$(1.0 \pm 0.3) \times 10^9$		p.r.	P.b.k.; 47% <i>e</i> -transfer.	75A207
279.111	R + PNAP → PNAP <sup>-</sup> (R = Radicals from glucose)	$9 \times 10^8$		p.r.		77R167
279.147	$^{\cdot}\text{CO}_2^- + \text{PNAP} \rightarrow \text{PNAP}^-$	$(1.0 \pm 0.1) \times 10^9$	10	p.r.	P.b.k. at 550 nm in N <sub>2</sub> O-satd. soln. contg. formate ion.	73G122
		$7 \times 10^8$		p.r.	Radical from formate.	77R167
280.	<b><i>o</i>-Nitroaniline</b>					
280.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{NH}_2\text{C}_6\text{H}_4\text{NO}_2 \rightarrow$ $(\text{CH}_3)_2\text{CO} + \text{H}^+ + \text{NH}_2\text{C}_6\text{H}_4\dot{\text{N}}\text{O}_2^-$	$9.2 \times 10^8$	7	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> 2-PrOH.	76A020
281.	<b><i>m</i>-Nitroaniline</b>					
281.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{NH}_2\text{C}_6\text{H}_4\text{NO}_2 \rightarrow$ $(\text{CH}_3)_2\text{CO} + \text{H}^+ + \text{NH}_2\text{C}_6\text{H}_4\dot{\text{N}}\text{O}_2^-$	$1.5 \times 10^9$	7	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> 2-PrOH.	76A020
282.	<b><i>p</i>-Nitroaniline</b>					
282.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{NH}_2\text{C}_6\text{H}_4\text{NO}_2 \rightarrow$ $(\text{CH}_3)_2\text{CO} + \text{H}^+ + \text{NH}_2\text{C}_6\text{H}_4\dot{\text{N}}\text{O}_2^-$	$7.2 \times 10^8$	7	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> 2-PrOH.	76A020
		$(1.9 \pm 0.2) \times 10^9$	10.7	p.r.	P.b.k. at 380 nm in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> 2-PrOH.	77A118
283.	<b>Nitrobenzene</b>					
283.018	R + C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub> (R = Radicals from allyl alcohol)	$\sim 1.5 \times 10^9$ (uncor.)	7	p.r.	P.b.k. at 400 nm in N <sub>2</sub> O-satd. soln. contg. allyl alcohol; 5% <i>e</i> -transfer.	73A062

TABLE 2. Rate constants for reactions of aliphatic radicals with organic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
283.019	R + C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub> (R = Radicals from crotyl alcohol)	~1 x 10 <sup>9</sup> (uncor.)	7	p.r.	P.b.k. at 400 nm in N <sub>2</sub> O-satd. soln. contg. crotyl alcohol; 8% <i>e</i> -transfer.	73A062
283.075	·CH <sub>2</sub> OH + C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub> → CH <sub>2</sub> O + C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub> <sup>-</sup>	<10 <sup>7</sup> (6.0 ± 0.9) x 10 <sup>7</sup>	7 5-6	p.r. p.r.	P.b.k. at 285 nm in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> MeOH. N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> MeOH.	66G432 72A018
283.076	·CH <sub>2</sub> O <sup>+</sup> + C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub> → CH <sub>2</sub> O + C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub> <sup>-</sup> CH <sub>3</sub> CHOH + C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub> → CH <sub>3</sub> CHO + H <sup>+</sup> + C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub> <sup>-</sup>	2.7 x 10 <sup>9</sup> 3.3 x 10 <sup>8</sup> (2.4 ± 0.7) x 10 <sup>8</sup>	13 7 5-6	p.r. p.r. p.r.	P.b.k. at 285 nm in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> MeOH. P.b.k. at 285 nm in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> EtOH. N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> EtOH.	66G432 66G432 72A018
	CH <sub>3</sub> CHO <sup>-</sup> + C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub> → CH <sub>3</sub> CHO + C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub> <sup>-</sup>	3.1 x 10 <sup>9</sup> 3 x 10 <sup>9</sup>	13 13	p.r. p.r.	P.b.k. at 285 nm in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> EtOH. P.b.k. at 285 nm in N <sub>2</sub> O-satd. soln. contg. EtOH; <i>E</i> <sub>a</sub> = 3.3 kcal mol <sup>-1</sup> (14 kJ mol <sup>-1</sup> ).	66G432 74A010
283.077	CH <sub>3</sub> CH <sub>2</sub> CHOH + C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub> → CH <sub>3</sub> CH <sub>2</sub> CHO + H <sup>+</sup> + C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub> <sup>-</sup>	3.5 x 10 <sup>8</sup> 1.0 x 10 <sup>9</sup> (uncor.)	7 7	p.r. p.r.	P.b.k. at 285 nm in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> 1-PrOH; 68% <i>e</i> - transfer. P.b.k. at 400 nm in N <sub>2</sub> O-satd. soln. contg. 1-PrOH; 60% <i>e</i> -transfer.	66G432 73A062
	CH <sub>3</sub> CH <sub>2</sub> CHO <sup>-</sup> + C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub> → CH <sub>3</sub> CH <sub>2</sub> CHO + C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub> <sup>-</sup>	3.1 x 10 <sup>9</sup>	13	p.r.	P.b.k. at 285 nm in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> 1-PrOH.	66G432
283.078	(CH <sub>3</sub> ) <sub>2</sub> CHOH + C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub> → (CH <sub>3</sub> ) <sub>2</sub> CO + H <sup>+</sup> + C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub> <sup>-</sup> (CH <sub>3</sub> ) <sub>2</sub> CHO <sup>-</sup> + C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub> → (CH <sub>3</sub> ) <sub>2</sub> CO + C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub> <sup>-</sup>	1.6 x 10 <sup>9</sup> 3.0 x 10 <sup>9</sup>	7 13	p.r. p.r.	P.b.k. at 285 nm in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> 2-PrOH. P.b.k. at 285 nm in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> 2-PrOH.	66G432 66G432
283.079	CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> CHOH + C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub> → CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> CHO + H <sup>+</sup> + C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub> <sup>-</sup>	4.0 x 10 <sup>8</sup> 1.1 x 10 <sup>9</sup> (uncor.)	7 7	p.r. p.r.	P.b.k. at 285 nm in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> 1-BuOH; 35% <i>e</i> - transfer. P.b.k. at 400 nm in N <sub>2</sub> O-satd. soln. contg. 1-BuOH; 31% <i>e</i> -transfer;	66G432 73A062
	CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> CHO <sup>-</sup> + C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub> → CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> CHO + C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub> <sup>-</sup>	3.1 x 10 <sup>9</sup>	13	p.r.	P.b.k. at 285 nm in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> 1-BuOH.	66G432
283.081	(CH <sub>3</sub> ) <sub>2</sub> CHCHOH + C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub> → (CH <sub>3</sub> ) <sub>2</sub> CHCHO + H <sup>+</sup> + C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub> <sup>-</sup>	3.9 x 10 <sup>8</sup>	7	p.r.	P.b.k. at 285 nm in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> 2-methyl-1-propanol; 39% <i>e</i> -transfer.	66G432
	(CH <sub>3</sub> ) <sub>2</sub> CHCHO <sup>-</sup> + C <sub>6</sub> H <sub>5</sub> NO → (CH <sub>3</sub> ) <sub>2</sub> CHCHO + C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub> <sup>-</sup>	2.9 x 10 <sup>9</sup>	13	p.r.	P.b.k. at 285 nm in N <sub>2</sub> O-satd. soln. contg. 2-methyl-1-propanol.	66G432
283.084	-CH <sub>2</sub> CHOH(CH <sub>2</sub> ) <sub>2</sub> - + C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub> → R=O + H <sup>+</sup> + C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub> <sup>-</sup>	1.5 x 10 <sup>9</sup>		p.r.	P.b.k. at 280 nm in soln. contg. 10 <sup>-3</sup> mol L <sup>-1</sup> cyclobutanone and 0.1 mol L <sup>-1</sup> <i>tert</i> -BuOH at 2°C; <i>k</i> = 3.2 x 10 <sup>9</sup> at 64°C; <i>E</i> <sub>a</sub> = 2.3 kcal mol <sup>-1</sup> (9.6 kJ mol <sup>-1</sup> ).	76A103
283.085	-CH <sub>2</sub> CHOH(CH <sub>2</sub> ) <sub>3</sub> - + C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub> → R=O + C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub> <sup>-</sup>	1.4 x 10 <sup>9</sup>		p.r.	P.b.k. at 280 nm in soln. contg. 10 <sup>-3</sup> mol L <sup>-1</sup> cyclopentanone and 0.1 mol L <sup>-1</sup> <i>tert</i> -BuOH at 2°C; <i>k</i> = 5.2 x 10 <sup>9</sup> at 64°C; <i>E</i> <sub>a</sub> = 4.0 kcal mol <sup>-1</sup> (17 kJ mol <sup>-1</sup> ).	76A103
283.086	-CH <sub>2</sub> CHOH(CH <sub>2</sub> ) <sub>4</sub> - + C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub> → R=O + C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub> <sup>-</sup>	7 x 10 <sup>8</sup>		p.r.	P.b.k. at 280 nm in soln. contg. 10 <sup>-3</sup> mol L <sup>-1</sup> cyclohexanone and 0.1 mol L <sup>-1</sup> <i>tert</i> -BuOH at 2°C; <i>k</i> = 2.0 x 10 <sup>9</sup> at 64°C <i>E</i> <sub>a</sub> = 3.1 kcal mol <sup>-1</sup> (13 kJ mol <sup>-1</sup> ).	76A103
283.087	-CH <sub>2</sub> CHOH(CH <sub>2</sub> ) <sub>5</sub> - + C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub> → R=O + C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub> <sup>-</sup>	1.4 x 10 <sup>9</sup>		p.r.	P.b.k. at 280 nm in soln. contg. 10 <sup>-3</sup> mol L <sup>-1</sup> cycloheptanone and 0.1 mol L <sup>-1</sup> <i>tert</i> -BuOH at 2°C; <i>k</i> = 4.9 x 10 <sup>9</sup> at 64°C; <i>E</i> <sub>a</sub> = 3.8 kcal mol <sup>-1</sup> (16 kJ mol <sup>-1</sup> ).	76A103



TABLE 2. Rate constants for reactions of aliphatic radicals with organic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
283.088	$-\text{CH}_2\dot{\text{C}}\text{OH}(\text{CH}_2)_6^- + \text{C}_6\text{H}_5\text{NO}_2 \rightarrow$ $\text{R}=\text{O} + \text{C}_6\text{H}_5\dot{\text{N}}\text{O}_2^-$	$1.6 \times 10^9$		p.r.	P.b.k. at 280 nm in soln. contg. $10^{-3}$ mol L <sup>-1</sup> cyclooctanone and 0.1 mol L <sup>-1</sup> <i>tert</i> -BuOH at 2°C; $k = 5.2 \times 10^9$ at 64°C; $E_a = 3.7$ kcal mol <sup>-1</sup> (15.5 kJ mol <sup>-1</sup> ).	76A103
283.093	$\text{CH}_3\dot{\text{C}}\text{HOC}_2\text{H}_5 + \text{C}_6\text{H}_5\text{NO}_2$	$2.5 \times 10^8$		p.r.	D.k.; radical from ethyl ether.	77A100
283.104	$-\text{O}\dot{\text{C}}\text{HCH}_2\text{O}(\text{CH}_2)_2^- + \text{C}_6\text{H}_5\text{NO}_2$	$2.5 \times 10^7$		p.r.	D.k.; radical from dioxane.	77A100
283.117	$\text{CH}_3\dot{\text{C}}\text{OHCO}_2^- + \text{C}_6\text{H}_5\text{NO}_2$	$(6.5 \pm 2) \times 10^7$	6.0	p.r.	N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> lactate ion.	72A018
283.123	$\cdot\text{CH}(\text{OH})_2 + \text{C}_6\text{H}_5\text{NO}_2 \rightarrow$ $\text{HCO}_2^- + 2 \text{H}^+ + \text{C}_6\text{H}_5\dot{\text{N}}\text{O}_2^-$	$1.9 \times 10^9$	5.8	p.r.	P.b.k. at 290 nm in N <sub>2</sub> O-satd. soln. contg. $10^{-2}$ mol L <sup>-1</sup> formaldehyde; also condy.	71G424
	$\cdot\text{CH}(\text{OH})\text{O}^- + \text{C}_6\text{H}_5\text{NO}_2 \rightarrow$ $\text{HCO}_2^- + \text{H}^+ + \text{C}_6\text{H}_5\dot{\text{N}}\text{O}_2^-$	$4.5 \times 10^9$	12			
283.147	$\cdot\text{CO}_2^- + \text{C}_6\text{H}_5\text{NO}_2 \rightarrow$ $\text{CO}_2 + \text{C}_6\text{H}_5\dot{\text{N}}\text{O}_2^-$	$(1.0 \pm 0.2) \times 10^9$ $(5.6 \pm 1) \times 10^8$ $(5.8 \pm 0.6) \times 10^8$ $(7.5 \pm 0.7) \times 10^8$ $(4.6 \pm 0.5) \times 10^8$	6-7 ~3 9.4 2.5 0	p.r. p.r.	P.b.k. at 295 nm in N <sub>2</sub> O-satd. soln. contg. $10^{-3}$ mol L <sup>-1</sup> formate. P.b.k.	70G303 73G085
284.	<b><i>o</i>-Nitrobenzoate ion</b>					
284.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{NO}_2\text{C}_6\text{H}_4\text{CO}_2^- \rightarrow$ $(\text{CH}_3)_2\text{CO} + \text{H}^+ + \dot{\text{N}}\text{O}_2^-\text{C}_6\text{H}_4\text{CO}_2^-$	$5.4 \times 10^8$	7	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. 2-PrOH; at pH 0.8 $k$ was the same $\pm$ 20-30%.	76A111
284.147	$\cdot\text{CO}_2^- + \text{NO}_2\text{C}_6\text{H}_4\text{CO}_2^- \rightarrow$ $\text{CO}_2 + \dot{\text{N}}\text{O}_2^-\text{C}_6\text{H}_4\text{CO}_2^-$	$2.4 \times 10^8$	7	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. formate; at pH 0.8 $k$ was the same $\pm$ 20-30%.	76A111
285.	<b><i>m</i>-Nitrobenzoate ion</b>					
285.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{NO}_2\text{C}_6\text{H}_4\text{CO}_2^- \rightarrow$ $(\text{CH}_3)_2\text{CO} + \text{H}^+ + \dot{\text{N}}\text{O}_2^-\text{C}_6\text{H}_4\text{CO}_2^-$	$9.0 \times 10^8$	7	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. 2-PrOH; at pH 0.8 $k$ was the same $\pm$ 20-30%.	76A111
285.147	$\cdot\text{CO}_2^- + \text{NO}_2\text{C}_6\text{H}_4\text{CO}_2^- \rightarrow$ $\text{CO}_2 + \dot{\text{N}}\text{O}_2^-\text{C}_6\text{H}_4\text{CO}_2^-$	$6.3 \times 10^8$	7	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. formate; at pH 0.8 $k$ was the same $\pm$ 20-30%.	76A111
286.	<b><i>p</i>-Nitrobenzoate ion</b>					
286.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{NO}_2\text{C}_6\text{H}_4\text{CO}_2^- \rightarrow$ $(\text{CH}_3)_2\text{CO} + \text{H}^+ + \dot{\text{N}}\text{O}_2^-\text{C}_6\text{H}_4\text{CO}_2^-$	$2.1 \times 10^9$	7	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. 2-PrOH; at pH 0.8 $k$ was the same $\pm$ 20-30%.	76A111
286.147	$\cdot\text{CO}_2^- + \text{NO}_2\text{C}_6\text{H}_4\text{CO}_2^- \rightarrow$ $\text{CO}_2 + \dot{\text{N}}\text{O}_2^-\text{C}_6\text{H}_4\text{CO}_2^-$	$8.0 \times 10^8$	7	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. formate; at pH 0.8 $k$ was the same $\pm$ 20-30%.	76A111
287.	<b><i>p</i>-Nitrobenzotrile</b>					
287.111	$\text{R} + \text{NO}_2\text{C}_6\text{H}_4\text{CN}$ (R = Radicals from glucose)	$1.0 \times 10^9$		p.r.		77R167
287a.	<b>Nitro blue tetrazolium</b>					
287a.147	$\cdot\text{CO}_2^- + \text{NBT}^{2+} \rightarrow \text{CO}_2 + \text{NBT}^{\cdot+}$	$(6.4 \pm 0.2) \times 10^9$	10	p.r.	P.b.k. at 405 nm in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> formate.	80A085
	<i>anti</i> -5-Nitro-2-furaldoxime see Nifuroxime 278.					
288.	<b>5-Nitrofuroate ion</b>					
288.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \dots\text{NO}_2 \rightarrow$ $(\text{CH}_3)_2\text{CO} + \text{H}^+ + \dot{\text{N}}\text{O}_2^-$	$1.5 \times 10^9$	7	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> 2-PrOH.	73G114
289.	<b>2-Nitroimidazole</b>					
289.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{NX} \rightarrow$ $(\text{CH}_3)_2\text{CO} + \text{H}^+ + \text{NX}^-$	$3.5 \times 10^9$		p.r.	P.b.k.	76A075
290.	<b>4-Nitroimidazole</b>					
290.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{NX} \rightarrow$ $(\text{CH}_3)_2\text{CO} + \text{H}^+ + \text{NX}^-$	$3.5 \times 10^9$		p.r.	P.b.k.	76A075

TABLE 2. Rate constants for reactions of aliphatic radicals with organic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
291.	<b>2-Nitroisophthalate ion</b>					
291.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + (\text{O}_2\text{C})_2\text{C}_6\text{H}_3\text{NO}_2 \rightarrow$ $(\text{CH}_3)_2\text{CO} + \text{H}^+ + (\text{O}_2\text{C})_2\text{C}_6\text{H}_3\dot{\text{N}}\text{O}_2^-$	$1.5 \times 10^8$	7	p.r.	P.b.k. at 310 nm in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> 2-PrOH.	76A020
292.	<b>Nitromethane</b>					
292.047	$\cdot\text{CF}_3 + \text{CH}_2\text{NO}_2^- \rightarrow$ $\text{CF}_3\text{CH}_2\dot{\text{N}}\text{O}_2^-$	$5 \times 10^8$ (rel.)		$\gamma$ -r.	C.k. in soln. contg. 1 mol L <sup>-1</sup> 2-PrOH and CF <sub>3</sub> Cl; rel. to $k(\text{CF}_3 + 2\text{-PrOH}) = 10^8$ ; product radical identified by esr.	72G244
293.	<b><i>p</i>-Nitroperoxybenzoic acid</b>					
293.075	$\cdot\text{CH}_2\text{OH} + \text{NO}_2\text{C}_6\text{H}_4\text{CO}_2\text{OH} \rightarrow$ $\text{CH}_2\text{O} + \text{H}^+ + \dot{\text{N}}\text{O}_2\text{C}_6\text{H}_4\text{CO}_2\text{OH}$ (+ adduct formn.)	$2 \times 10^8$		p.r.	P.b.k. at 330 nm in N <sub>2</sub> O-satd. soln. contg. MeOH; 20% $e$ -transfer based on condy. change.	74A078
293.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{NO}_2\text{C}_6\text{H}_4\text{CO}_2\text{OH} \rightarrow$ $(\text{CH}_3)_2\text{CO} + \text{H}^+ + \dot{\text{N}}\text{O}_2\text{C}_6\text{H}_4\text{CO}_2\text{OH}$	$3.3 \times 10^9$	5.0	p.r.	P.b.k. at 330 nm in N <sub>2</sub> O-satd. soln. contg. 2-PrOH.	74A078
294.	<b><i>o</i>-Nitrophenol</b>					
294.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{HOC}_6\text{H}_4\text{NO}_2 \rightarrow$ $(\text{CH}_3)_2\text{CO} + \text{H}^+ + \text{HOC}_6\text{H}_4\dot{\text{N}}\text{O}_2^-$	$2.6 \times 10^9$	1	p.r.	P.b.k. in soln. contg. 2-PrOH.	69G270
	$(\text{CH}_3)_2\dot{\text{C}}\text{O}^- + \text{OC}_6\text{H}_4\text{NO}_2 \rightarrow$	$1.4 \times 10^9$	13	p.r.	P.b.k. in soln. contg. 2-PrOH.	69G270
295.	<b>2-Nitropyrrole</b>					
295.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{NX} \rightarrow$ $(\text{CH}_3)_2\text{CO} + \text{H}^+ + \text{NX}^-$	$2.0 \times 10^9$		p.r.	P.b.k.	76A075
296.	<b>3-Nitropyrrole</b>					
296.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{NX} \rightarrow$ $(\text{CH}_3)_2\text{CO} + \text{H}^+ + \text{NX}^-$	$2.0 \times 10^9$		p.r.	P.b.k.	76A075
<i>2-Nitroresorcinol See 1,3-Dihydroxy-2-nitrobenzene 17B.</i>						
297.	<b>Nitrosobenzene</b>					
297.075	$\cdot\text{CH}_2\text{OH} + \text{C}_6\text{H}_5\dot{\text{N}}\text{O} \rightarrow$ $\text{CH}_2\text{O} + \text{C}_6\text{H}_5\dot{\text{N}}\text{OH}$	$3.2 \times 10^9$	7.0	p.r.	P.b.k. at 450 nm in N <sub>2</sub> O-satd. soln. contg. 0.05 mol L <sup>-1</sup> MeOH.	66G433
	$\cdot\text{CH}_2\text{O}^- + \text{C}_6\text{H}_5\dot{\text{N}}\text{O} \rightarrow$ $\text{CH}_2\text{O} + \text{C}_6\text{H}_5\dot{\text{N}}\text{O}^-$	$6.8 \times 10^9$	13.0	p.r.	P.b.k. at 450 nm in N <sub>2</sub> O-satd. soln. contg. 0.05 mol L <sup>-1</sup> MeOH.	66G433
297.076	$\text{CH}_3\dot{\text{C}}\text{HOH} + \text{C}_6\text{H}_5\dot{\text{N}}\text{O} \rightarrow$ $\text{CH}_3\dot{\text{C}}\text{HO} + \text{C}_6\text{H}_5\dot{\text{N}}\text{OH}$	$3.9 \times 10^9$	7.0	p.r.	P.b.k. at 450 nm in N <sub>2</sub> O-satd. soln. contg. 0.05 mol L <sup>-1</sup> EtOH.	66G433
	$\text{CH}_3\dot{\text{C}}\text{HO}^- + \text{C}_6\text{H}_5\dot{\text{N}}\text{O} \rightarrow$ $\text{CH}_3\dot{\text{C}}\text{HO} + \text{C}_6\text{H}_5\dot{\text{N}}\text{O}^-$	$6.4 \times 10^9$	13.0	p.r.	P.b.k. at 450 nm in N <sub>2</sub> O-satd. soln. contg. 0.05 mol L <sup>-1</sup> EtOH.	66G433
297.077	$\text{CH}_3\text{CH}_2\dot{\text{C}}\text{HOH} + \text{C}_6\text{H}_5\dot{\text{N}}\text{O} \rightarrow$ $\text{CH}_3\text{CH}_2\dot{\text{C}}\text{HO} + \text{C}_6\text{H}_5\dot{\text{N}}\text{OH}$	$4.0 \times 10^9$	7.0	p.r.	P.b.k. at 450 nm in N <sub>2</sub> O-satd. soln. contg. 0.05 mol L <sup>-1</sup> 1-PrOH; includes $\beta$ -alcohol radical reaction.	66G433
297.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{C}_6\text{H}_5\dot{\text{N}}\text{O} \rightarrow$ $(\text{CH}_3)_2\text{CO} + \text{C}_6\text{H}_5\dot{\text{N}}\text{OH}$	$5.0 \times 10^9$	7.0	p.r.	P.b.k. at 450 nm in N <sub>2</sub> O-satd. soln. contg. 0.05 mol L <sup>-1</sup> 2-PrOH.	66G433
	$(\text{CH}_3)_2\dot{\text{C}}\text{O}^- + \text{C}_6\text{H}_5\dot{\text{N}}\text{O} \rightarrow$ $(\text{CH}_3)_2\text{CO} + \text{C}_6\text{H}_5\dot{\text{N}}\text{O}^-$	$7.0 \times 10^9$	13.0	p.r.	P.b.k. at 450 nm in N <sub>2</sub> O-satd. soln. contg. 0.05 mol L <sup>-1</sup> 2-PrOH.	66G433
297.079	$\text{CH}_3\text{CH}_2\text{CH}_2\dot{\text{C}}\text{HOH} + \text{C}_6\text{H}_5\dot{\text{N}}\text{O} \rightarrow$ $\text{CH}_3\text{CH}_2\text{CH}_2\dot{\text{C}}\text{HO} + \text{C}_6\text{H}_5\dot{\text{N}}\text{OH}$	$4.0 \times 10^9$	7.0	p.r.	P.b.k. at 450 nm in N <sub>2</sub> O-satd. soln. contg. 0.05 mol L <sup>-1</sup> 1-BuOH; includes $\beta$ - and $\gamma$ -alcohol radical reaction.	66G433
297.081	$(\text{CH}_3)_2\text{CH}\dot{\text{C}}\text{HOH} + \text{C}_6\text{H}_5\dot{\text{N}}\text{O} \rightarrow$ $(\text{CH}_3)_2\text{CH}\dot{\text{C}}\text{HO} + \text{C}_6\text{H}_5\dot{\text{N}}\text{OH}$	$4.0 \times 10^9$	7.0	p.r.	P.b.k. at 450 nm in N <sub>2</sub> O-satd. soln. contg. 0.05 mol L <sup>-1</sup> 2-methyl-1-propanol; includes $\beta$ -alcohol radical reaction.	66G433
297.147	$\cdot\text{CO}_2^- + \text{C}_6\text{H}_5\dot{\text{N}}\text{O} \rightarrow$ $\text{CO}_2 + \text{C}_6\text{H}_5\dot{\text{N}}\text{O}^-$	$4.0 \times 10^9$		p.r.	P.b.k. at 450 nm in soln. contg. formate ion.	66G433
<i><i>p</i>-Nitroso-<i>N,N</i>-dimethylaniline See <i>N,N</i>-Dimethyl-4-nitrosoaniline, 186a.</i>						
298.	<b>2-Nitrothiophene</b>					
298.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{NX} \rightarrow$ $(\text{CH}_3)_2\text{CO} + \text{H}^+ + \text{NX}^-$	$3.0 \times 10^9$		p.r.	P.b.k.	76A075

TABLE 2. Rate constants for reactions of aliphatic radicals with organic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
299. 299.078	<b>3-Nitrothiophene</b> (CH <sub>3</sub> ) <sub>2</sub> ĊOH + NX → (CH <sub>3</sub> ) <sub>2</sub> CO + H <sup>+</sup> + NX <sup>-</sup>	2.0 x 10 <sup>9</sup>		p.r.	P.b.k.	76A075
300. 300.078	<b>o-Nitrotoluene</b> (CH <sub>3</sub> ) <sub>2</sub> ĊOH + CH <sub>3</sub> C <sub>6</sub> H <sub>4</sub> NO <sub>2</sub> → (CH <sub>3</sub> ) <sub>2</sub> CO + H <sup>+</sup> + CH <sub>3</sub> C <sub>6</sub> H <sub>4</sub> NO <sub>2</sub> <sup>-</sup>	4.8 x 10 <sup>8</sup>	7	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> 2-PrOH.	76A020
301. 301.078	<b>5-Nitrouracil</b> (CH <sub>3</sub> ) <sub>2</sub> ĊOH + NX	(7 ± 3.5) x 10 <sup>8</sup>		p.r.		73A150
302. 302.016 302.078	<b>Norpseudopelletierine-N-oxyl</b> ·CH <sub>2</sub> C(CH <sub>3</sub> ) <sub>2</sub> OH + NPPN (CH <sub>3</sub> ) <sub>2</sub> ĊOH + NPPN	(5.1 ± 0.5) x 10 <sup>8</sup> (8.1 ± 0.8) x 10 <sup>8</sup>		p.r. p.r.		71G061 71G061
303. 303.078	<b>Orotate ion</b> (CH <sub>3</sub> ) <sub>2</sub> ĊOH + orotate	(1 ± 0.5) x 10 <sup>8</sup>		p.r.		73A150
	<i>Paraquat See 1,1'-Dimethyl-4,4'-bipyridinium ion 183.</i>					
304. 304.075	<b>Penicillamine</b> ·CH <sub>2</sub> OH + RSH → CH <sub>3</sub> OH + RS· (→ RSSR <sup>-</sup> )	(1.1 ± 0.1) x 10 <sup>8</sup>		p.r.	P.b.k. at 450 nm in soln. contg. 0.5 or 1 mol L <sup>-1</sup> MeOH.	73A073
305. 305.001	<b>3-Pentanone</b> ·CH <sub>3</sub> + C <sub>2</sub> H <sub>5</sub> COC <sub>2</sub> H <sub>5</sub> → CH <sub>4</sub> + CH <sub>3</sub> ĊCOC <sub>2</sub> H <sub>5</sub>	1.4 x 10 <sup>4</sup>	~1	chem.	Radical from dimethyl sulfoxide in Ti <sup>III</sup> -H <sub>2</sub> O <sub>2</sub> soln.; est. from esr meas. and values for competing reactions.	75D188
306. 306.075	<b>1,10-Phenanthroline</b> ·CH <sub>2</sub> OH + phen ·CH <sub>2</sub> O <sup>-</sup> + phen	<10 <sup>6</sup> <10 <sup>6</sup> <1 x 10 <sup>7</sup>	7 13 ~13	p.r. p.r.	P.b.k. in soln. contg. 0.2 mol L <sup>-1</sup> MeOH. P.b.k. at 490 nm in N <sub>2</sub> O-satd. soln. contg. 1 mol L <sup>-1</sup> MeOH.	79A148 80A115
306.076	CH <sub>3</sub> ĊHO <sup>-</sup> + phen → ·phenH	(8 ± 2) x 10 <sup>8</sup>	~13	p.r.	P.b.k. at 490 nm in N <sub>2</sub> O-satd. soln. contg. 1 mol L <sup>-1</sup> EtOH.	80A115
306.078	(CH <sub>3</sub> ) <sub>2</sub> ĊOH + phen → ·phenH	(3.2 ± 0.2) x 10 <sup>9</sup>	1	p.r.	P.b.k. at 520 nm in soln. contg. 1 mol L <sup>-1</sup> 2-PrOH.	80A115
		1.9 x 10 <sup>9</sup>	3.0	p.r.	P.b.k. in Ar-satd. soln. contg. 0.1 mol L <sup>-1</sup> 2-PrOH.	79A148
		1 x 10 <sup>8</sup>	5.5	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. 2-PrOH.	80A115
		<1 x 10 <sup>7</sup>	8			
		1.2 x 10 <sup>7</sup>	7		P.b.k. in soln. contg. 2-PrOH and acetone.	79A148
	(CH <sub>3</sub> ) <sub>2</sub> ĊO <sup>-</sup> + phen → ·phenH	6.0 x 10 <sup>8</sup>	13		P.b.k. in Ar-satd. soln. contg. 0.1 mol L <sup>-1</sup> 2-PrOH.	79A148
		5.7 x 10 <sup>8</sup>	13	p.r.	P.b.k.	79A305
		(3.0 ± 0.5) x 10 <sup>9</sup>	~13	p.r.	P.b.k. at 490 nm in N <sub>2</sub> O-satd. soln. contg. 1 mol L <sup>-1</sup> 2-PrOH.	80A115
307. 307.078	<b>Phenazine</b> (CH <sub>3</sub> ) <sub>2</sub> ĊO <sup>-</sup> + Pz → (CH <sub>3</sub> ) <sub>2</sub> CO + ·PzH	3 x 10 <sup>9</sup>	13	p.r.	p.b.k.	79A305
308. 308.056	<b>Phenosafuranine</b> NH <sub>2</sub> ĊHCO <sub>2</sub> <sup>-</sup> + dye	1.9 x 10 <sup>9</sup> (uncor.)	7	p.r.	D.k. at 520 nm in N <sub>2</sub> O-satd. soln. contg. glycine; 66% e-transfer.	73A078
308.075	·CH <sub>2</sub> OH + dye	1.2 x 10 <sup>9</sup> (uncor.)	7	p.r.	D.k. at 520 nm in N <sub>2</sub> O-satd. soln. contg. MeOH; 22% e-transfer.	73A078
308.078	(CH <sub>3</sub> ) <sub>2</sub> ĊOH + dye	3.2 x 10 <sup>9</sup>	7	p.r.	D.k. at 520 nm in N <sub>2</sub> O-satd. soln. contg. 2-PrOH; 82% e-transfer.	73A078

TABLE 2. Rate constants for reactions of aliphatic radicals with organic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
309. 309.020	<b>Phenoxide ion</b> ·CH <sub>2</sub> CHO + C <sub>6</sub> H <sub>5</sub> O <sup>-</sup> (+ H <sub>2</sub> O) → CH <sub>3</sub> CHO + C <sub>6</sub> H <sub>5</sub> O· + OH <sup>-</sup>	4.3 x 10 <sup>6</sup>	~11.5	p.r.	Soln. contg. N <sub>2</sub> O and ethylene glycol.	79A051
310. 310.020	<b><i>o</i>-Phenylenediamine</b> ·CH <sub>2</sub> CHO + H <sub>2</sub> NC <sub>6</sub> H <sub>4</sub> NH <sub>2</sub> → CH <sub>3</sub> CHO + H <sub>2</sub> NC <sub>6</sub> H <sub>4</sub> NH	7.3 x 10 <sup>7</sup>	~11.5	p.r.	Soln. contg. N <sub>2</sub> O and ethylene glycol.	79A051
311. 311.020	<b><i>p</i>-Phenylenediamine</b> ·CH <sub>2</sub> CHO + H <sub>2</sub> NC <sub>6</sub> H <sub>4</sub> NH <sub>2</sub> → CH <sub>3</sub> CHO + H <sub>2</sub> NC <sub>6</sub> H <sub>4</sub> NH	4.0 x 10 <sup>8</sup>	~11.5	p.r.	Soln. contg. N <sub>2</sub> O and ethylene glycol.	79A051
312. 312.048	<b>Promethazine</b> ·CCl <sub>3</sub> + PZ	slow	12	p.r.	Suggested that fast reaction is with CCl <sub>3</sub> O <sub>2</sub> and not ·CCl <sub>3</sub> .	78B128 80A053
313. 313.047	<b>1-Propanol</b> ·CF <sub>3</sub> + CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> OH	(4.4 ± 0.7) x 10 <sup>4</sup> (rel.)	9-10	γ-r.	C.k. with addn. of CF <sub>3</sub> to propylene obs. $G(\text{CF}_3\text{H})$ ; rel. to $k(\text{CF}_3 + \text{HCO}_2^-)$ = 3.4 x 10 <sup>5</sup> .	70G407
314. 314.001	<b>2-Propanol</b> ·CH <sub>3</sub> + (CH <sub>3</sub> ) <sub>2</sub> CHOH → CH <sub>4</sub> + (CH <sub>3</sub> ) <sub>2</sub> ĊOH	3.4 x 10 <sup>3</sup> (rel.)		γ-r.	C.k. with O <sub>2</sub> ; radical from MeI; rel. to $k(\text{CH}_3 + \text{O}_2) = 4.7 \times 10^9$ .	67G041
		>(1.6 ± 0.3) x 10 <sup>3</sup> (rel.)	1	phot.	Est. from effect of addn. of 2-PrOH on CH <sub>4</sub> and C <sub>2</sub> H <sub>6</sub> yields in photolysis of Co(NH <sub>3</sub> ) <sub>5</sub> O <sub>2</sub> CCH <sub>3</sub> <sup>2+</sup> .	71F579
314.015	·CH <sub>2</sub> CHOHCH <sub>3</sub> + (CH <sub>3</sub> ) <sub>2</sub> CHOH → (CH <sub>3</sub> ) <sub>2</sub> CHOH + (CH <sub>3</sub> ) <sub>2</sub> ĊOH	>53 ± 10		γ-r.	Est. from rel. rates and $G(-\text{H}_2\text{O}_2)$ in soln. contg. H <sub>2</sub> O <sub>2</sub> and 2-PrOH.	70G104
314.047	·CF <sub>3</sub> + (CH <sub>3</sub> ) <sub>2</sub> CHOH → CHF <sub>3</sub> + (CH <sub>3</sub> ) <sub>2</sub> ĊOH	(9.2 ± 0.9) x 10 <sup>4</sup> (rel.)	9-10	γ-r.	C.k. with addn. of ·CF <sub>3</sub> to propylene; obs. $G(\text{CHF}_3)$ ; rel. to $k(\text{CF}_3 + \text{HCO}_2^-)$ = 3.4 x 10 <sup>5</sup> .	70G407
314.048	·CCl <sub>3</sub> + (CH <sub>3</sub> ) <sub>2</sub> CHOH → CCl <sub>3</sub> · + H <sup>+</sup> + (CH <sub>3</sub> ) <sub>2</sub> ĊOH	~10 <sup>4</sup>		p.r.	Reaction proposed to explain initial increase of abs. of PNAP <sup>-</sup> in soln. contg. CCl <sub>4</sub> -PNAP-2-PrOH-acetone.	73A140
	·CCl <sub>3</sub> + (CH <sub>3</sub> ) <sub>2</sub> CHOH → CHCl <sub>3</sub> + (CH <sub>3</sub> ) <sub>2</sub> ĊOH	79		γ-r.	Calcd. from dependence of $G(\text{Cl}^-)$ on dose rate in soln. contg. CCl <sub>4</sub> and 2-PrOH assuming $2k(\text{CCl}_3 + \cdot\text{CCl}_3) =$ 10 <sup>9</sup> .	71G778
315. 315.001	<b>Propionic acid</b> ·CH <sub>3</sub> + CH <sub>3</sub> CH <sub>2</sub> CO <sub>2</sub> H → CH <sub>4</sub> + CH <sub>3</sub> ĊCO <sub>2</sub> H	3.0 x 10 <sup>3</sup>	~1	chem.	Radical from dimethyl sulfoxide in Ti <sup>III</sup> -H <sub>2</sub> O <sub>2</sub> soln.; est. from esr meas. and values for competing reactions.	75D188
316. 316.001	<b>Propionitrile</b> ·CH <sub>3</sub> + CH <sub>3</sub> CH <sub>2</sub> CN → CH <sub>4</sub> + CH <sub>3</sub> ĊCN	1.2 x 10 <sup>3</sup>	~1	chem.	Radical from dimethyl sulfoxide in Ti <sup>III</sup> -H <sub>2</sub> O <sub>2</sub> soln.; est. from esr meas. and values for competing reactions.	75D188
317. 317.001	<b>Propylene</b> ·CH <sub>3</sub> + CH <sub>3</sub> CH=CH <sub>2</sub> → addn.	5.3 x 10 <sup>3</sup> (rel.)		γ-r.	C.k. with 2-PrOH in soln. contg. MeI obs. $G(\text{CH}_4)$ ; rel. to $k(\text{CH}_3 + \text{O}_2) =$ 4.7 x 10 <sup>9</sup> .	67G041
317.047	·CF <sub>3</sub> + CH <sub>3</sub> CH=CH <sub>2</sub> → addn.	(7.2 ± 0.4) x 10 <sup>7</sup> (rel.)	9-10	γ-r.	C.k. with 2-PrOH; radical from CF <sub>3</sub> Cl; obs. $G(\text{CF}_3\text{H})$ by H abstr. from formate rel. to $k(\text{CF}_3 + \text{HCO}_2^-) = 3.4 \times 10^5$ .	70G407
<i>1,1'-Propylene-2,2'-bipyridinium ion See Trimethylene-2,2'-bipyridinium ion 354.</i>						
318. 318.075	<b>Pteridine</b> ·CH <sub>2</sub> OH + P	3.6 x 10 <sup>8</sup>	6.0	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. MeOH.	76A060

TABLE 2. Rate constants for reactions of aliphatic radicals with organic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
319.	<b>Pterin</b>					
319.075	$\cdot\text{CH}_2\text{OH} + \text{PtH}_2^+$	$9.0 \times 10^7$ (uncor.)	0.8	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln.	76A060
	$\cdot\text{CH}_2\text{OH} + \text{PtH}$	$\leq 10^7$	7.0		contg. MeOH; ~40% $e$ -transfer	
	$\cdot\text{CH}_2\text{O}^- + \text{Pt}^-$	$6.0 \times 10^8$	13.0		at pH 0.8, ~100% at pH 13.	
319.076	$\text{CH}_3\dot{\text{C}}\text{HOH} + \text{PtH}$	$3.7 \times 10^7$ (uncor.)	7.0	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln.	76A060
	$\text{CH}_3\dot{\text{C}}\text{HO}^- + \text{Pt}^-$	$1.2 \times 10^9$	13.0		contg. EtOH; ~40% $e$ -transfer at pH 7, ~100% at pH 13.	
319.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{PtH}_2^+$	$2.0 \times 10^9$	0.8	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln.	76A060
	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{PtH}$	$4.5 \times 10^8$	7.0		contg. 2-PrOH; ~100% $e$ -transfer.	
	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{Pt}^-$	$\leq 10^7$	9.4			
	$(\text{CH}_3)_2\dot{\text{C}}\text{O}^- + \text{Pt}^-$	$1.5 \times 10^9$	13.0			
319.147	$\cdot\text{CO}_2^- + \text{PtH}$	$4.6 \times 10^8$	7.0	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln.	76A060
	$\cdot\text{CO}_2^- + \text{Pt}^-$	$\leq 10^7$	9.5-13.0		contg. formate ion; 100% $e$ -transfer at pH 7.	
320.	<b>Purine</b>					
320.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{PH}_2^+$	$2.7 \times 10^9$	~0	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg.	75A060
	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{PH}$	$\leq 10^7$	6.0		1-2 mol L <sup>-1</sup> 2-PrOH.	
	$(\text{CH}_3)_2\dot{\text{C}}\text{O}^- + \text{P}^-$	$\leq 10^7$	13.3			
320.147	$\cdot\text{CO}_2^- + \text{PH}$	$\leq 10^7$	6.0	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln.	75A060
321.	<b>Pyrazine</b>					
321.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{PzH}^+$	$2.8 \times 10^9$	~0	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg.	74A127
	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{Pz}$	$\leq 10^7$	5.0, 11.0		2-PrOH; $k \approx 5 \times 10^9$ in 70% HClO <sub>4</sub> soln.	
	$(\text{CH}_3)_2\dot{\text{C}}\text{O}^- + \text{Pz}$	$1.7 \times 10^9$	13.6			
321.147	$\cdot\text{CO}_2^- + \text{Pz}$	$\leq 10^7$	5.0, 11.0	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. formate ion.	74A127
322.	<b>Pyrazinecarboxylic acid</b>					
322.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{PzCO}_2\text{H} \rightarrow (\text{CH}_3)_2\text{CO} + \cdot\text{Pz(H)CO}_2\text{H}$	$\sim 8.5 \times 10^8$		p.r.	P.b.k.	78A222
323.	<b>Pyrene</b>					
323.075	$\cdot\text{CH}_2\text{O}^- + \text{Py}$	no reaction	13	p.r.	Buildup of Py <sup>-</sup> in micellar soln. contg. 0.2 mol L <sup>-1</sup> MeOH after phot. attributed to triplet pyrene; $k(\cdot\text{CH}_2\text{O}^- + {}^3\text{Py}) = 1.8 \times 10^{10}$ .	76A062
323.076	$\text{CH}_3\dot{\text{C}}\text{HO}^- + \text{Py} \rightarrow \text{CH}_3\text{CHO} + \text{Py}^-$	$1.7 \times 10^8$	13	p.r.	P.b.k. at 495 nm in soln. contg. 0.2 mol L <sup>-1</sup> EtOH and 10 <sup>-3</sup> mol L <sup>-1</sup> pyrene solubilized by 5 x 10 <sup>-3</sup> mol L <sup>-1</sup> hexadecyl trimethylammonium bromide; after photolysis $k(\text{R} + {}^3\text{Py}) = 8 \times 10^9$ .	76A062
323.078	$(\text{CH}_3)_2\dot{\text{C}}\text{O}^- + \text{Py} \rightarrow (\text{CH}_3)_2\text{CO} + \text{Py}^-$	$2.3 \times 10^9$	13	p.r.	P.b.k. at 495 nm in soln. contg. 2 x 10 <sup>-4</sup> mol L <sup>-1</sup> pyrene, 0.2 mol L <sup>-1</sup> 2-PrOH, 0.1 mol L <sup>-1</sup> acetone and 5 x 10 <sup>-3</sup> mol L <sup>-1</sup> hexadecyl trimethyl-ammonium bromide; after photolysis $k(\text{R} + {}^3\text{Py}) = 2.3 \times 10^9$ .	76A062
323.147	$\cdot\text{CO}_2^- + \text{Py}$	no reaction	13	p.r.	Buildup of 495 nm abs. in micellar soln. (CO <sub>2</sub> -satd.) only after photolysis; $k(\cdot\text{CO}_2^- + {}^3\text{Py}) = 5 \times 10^9$ ; calcd. $k(\cdot\text{CO}_2^- + \text{Py}^-) = 1.8 \times 10^{10}$ from d.k. at 495 nm in micellar CO <sub>2</sub> -free soln. contg. formate ion.	76A062
324.	<b>Pyridazine</b>					
324.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{PdH}^+ \rightarrow (\text{CH}_3)_2\text{CO} + \cdot\text{PdH}_2^+$	$2.6 \times 10^9$	~0	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. 2-PrOH.	74A127
	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{Pd}$	$\leq 10^7$	5.0, 11.0			74A127
	$(\text{CH}_3)_2\dot{\text{C}}\text{O}^- + \text{Pd} \rightarrow (\text{CH}_3)_2\text{CO} + \cdot\text{PdH} + \text{OH}^-$	$2.1 \times 10^9$	13.6			74A127

TABLE 2. Rate constants for reactions of aliphatic radicals with organic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
324.147	$\cdot\text{CO}_2^- + \text{Pd}$	$<10^7$	5.0, 11.0	p.r.	$<10\%$ $e$ -transfer.	74A127
325.	<b>4-Pyridinecarboxaldoxime</b>					
325.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{HN}^+\text{C}_5\text{H}_4\text{CH}=\text{NOH}$	$1.7 \times 10^9$	acid	p.r.	P.b.k. (pyridinyl radical)	76A182
	$(\text{CH}_3)_2\dot{\text{C}}\text{O}^- + \text{NC}_5\text{H}_4\text{CH}=\text{NO}^-$	$<10^7$	7		in $\text{N}_2\text{O}$ -satd. soln. contg. 2-PrOH;	
		$1.7 \times 10^8$	13.3		$e$ -transfer in strong acid or base.	
326.	<b>2-Pyridinecarboxaldoxime methochloride</b>					
326.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{CH}_3\text{N}^+\text{C}_5\text{H}_4\text{CH}=\text{NOH}$	$6 \times 10^8$	3.7, 11	p.r.	P.b.k.; $e$ -transfer.	76A182
	<i>3-Pyridinecarboxamide See Nicotinamide 275.</i>					
	<i>4-Pyridinecarboxamide See Isonicotinamide 244.</i>					
	<i>3-Pyridinecarboxylic acid See Nicotinic acid 277.</i>					
	<i>4-Pyridinecarboxylic acid See Isonicotinic acid 245.</i>					
327.	<b>Pyridoxal-5-phosphate</b>					
327.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{P} \rightarrow \cdot\text{P}$	$5.8 \times 10^8$	1.0	p.r.	P.b.k. in $\text{N}_2\text{O}$ -satd. soln.	75A024
	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{P} \rightarrow \cdot\text{P}$	$1.3 \times 10^9$	5.6		contg. 1 mol L <sup>-1</sup> 2-PrOH.	
	$(\text{CH}_3)_2\dot{\text{C}}\text{O}^- + \text{P} \rightarrow \cdot\text{P}$	$2.9 \times 10^8$	10.0, 13.3			
328.	<b>Pyridoxine</b>					
328.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{PH}$	$<10^7$	1.7, 13.5	p.r.	P.b.k. in $\text{N}_2\text{O}$ -satd. soln. contg. 1 mol L <sup>-1</sup> 2-PrOH.	75A024
329.	<b>Pyrimidine</b>					
329.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{PmH}^+ \rightarrow$ $(\text{CH}_3)_2\dot{\text{C}}\text{O} + \cdot\text{PmH}_2^+$	$2.2 \times 10^9$	$\sim 0$	p.r.	P.b.k. in $\text{N}_2\text{O}$ -satd. soln. contg. 2-PrOH.	74A127
	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{Pm}$	$<10^7$	5.0, 11.0	p.r.	P.b.k. in $\text{N}_2\text{O}$ -satd. soln. contg. 2-PrOH.	74A127
	$(\text{CH}_3)_2\dot{\text{C}}\text{O}^- + \text{Pm}$	$<10^7$	13.6	p.r.	P.b.k. in $\text{N}_2\text{O}$ -satd. soln. contg. 2-PrOH.	74A127
329.147	$\cdot\text{CO}_2^- + \text{Pm}$	$<10^7$	5.0, 11.0	p.r.	P.b.k. in $\text{N}_2\text{O}$ -satd. soln. contg. formate ion; $<10\%$ $e$ -transfer.	74A127
330.	<b>Pyruvate ion</b>					
330.113	$\cdot\text{A}^- + \text{CH}_3\text{COCO}_2^-$ ( $\cdot\text{A}^- = \text{ascorbate radical}$ )	$<10$	8.6	p.r.	D.k. at 360 nm in $\text{N}_2\text{O}$ -satd. soln. contg. ascorbate ion.	75A240
331.	<b>Quinoxaline</b>					
331.076	$\text{CH}_3\dot{\text{C}}\text{HOH} + \text{Qx} \rightarrow$ $\text{CH}_3\dot{\text{C}}\text{HO} + \cdot\text{QxH}$	$6.5 \times 10^7$ (uncor.)	6.5	p.r.	P.b.k. in $\text{N}_2\text{O}$ -satd. soln. contg. EtOH; 70% $e$ -transfer.	74A127
331.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{QxH}^+ \rightarrow$ $(\text{CH}_3)_2\dot{\text{C}}\text{O} + \cdot\text{QxH}_2^+$	$3.7 \times 10^9$	$\sim 0$	p.r.	P.b.k. in $\text{N}_2\text{O}$ -satd. soln. contg. 2 mol L <sup>-1</sup> $\text{HClO}_4$ and 2 mol L <sup>-1</sup> 2-PrOH; $k \approx$ $7.0 \times 10^8$ at 70% $\text{HClO}_4$ .	74A127
	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{Qx} \rightarrow$ $(\text{CH}_3)_2\dot{\text{C}}\text{O} + \cdot\text{QxH}$	$1.6 \times 10^8$	6.5	p.r.	P.b.k. in $\text{N}_2\text{O}$ -satd. soln. contg. 2-PrOH.	74A127
	<i>Resorcinol See 1,3-Dihydroxybenzene 177.</i>					
332.	<b>Rhodamine B</b>					
332.147	$\cdot\text{CO}_2^- + \text{RhB} \rightarrow \text{CO}_2 + \text{RhB}_{\text{red}}$	$(1.8 \pm 0.5) \times 10^8$		p.r.	D.k. at 510 nm as well as p.b.k. at 410 nm in soln. contg. 0.1 mol L <sup>-1</sup> formate ion.	67E053
333.	<b>Riboflavin</b>					
333.056	$\text{NH}_2\dot{\text{C}}\text{HCO}_2^- + \text{RF}$	$(2.7 \pm 0.3) \times 10^9$	8.0	p.r.	P.b.k. at 560 nm in $\text{N}_2\text{O}$ -satd. soln. contg. glycine; $e$ -transfer.	73A104

TABLE 2. Rate constants for reactions of aliphatic radicals with organic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
333.078	(CH <sub>3</sub> ) <sub>2</sub> ĊOH + RF	(2.3 ± 0.2) × 10 <sup>9</sup>	7.0	p.r.	P.b.k. at 560 nm in N <sub>2</sub> O-satd. soln. contg. 2-PrOH; <i>e</i> -transfer.	73A104
333.115	ĊHOHCO <sub>2</sub> <sup>-</sup> + RF	(9.3 ± 0.9) × 10 <sup>8</sup>	7.0	p.r.	P.b.k. at 560 nm in N <sub>2</sub> O-satd. soln. contg. glycolate ion; <i>e</i> -transfer.	73A104
333.147	·CO <sub>2</sub> <sup>-</sup> + RF	1.4 × 10 <sup>9</sup> 3.6 × 10 <sup>9</sup> 3.6 × 10 <sup>9</sup> 3.0 × 10 <sup>9</sup> (1.7 ± 0.2) × 10 <sup>9</sup>	alk 5.9 3 H <sub>0</sub> = -2 7.0	p.r. p.r. p.r. p.r. p.r.	D.k. at 460 nm as well as p.b.k. at 560 nm (semiquinone) in N <sub>2</sub> O-satd. soln. contg. formate ion. D.k. at 420 nm in N <sub>2</sub> O-satd. soln. contg. formate ion. P.b.k. at 560 nm in N <sub>2</sub> O-satd. soln. contg. formate ion; <i>e</i> -transfer.	69G238 69G238 73A104
334.	<b>Riboflavine 5'-phosphate (Flavine mononucleotide)</b>					
334.078	(CH <sub>3</sub> ) <sub>2</sub> ĊOH + FMN	(1 ± 0.5) × 10 <sup>9</sup>		p.r.		73A150
335.	<b>Ribonuclease</b>					
335.045	·CHCl <sub>2</sub> + RNase	6 × 10 <sup>8</sup>	11	p.r.	P.b.k. in soln. contg. CHCl <sub>3</sub> and <i>tert</i> -BuOH.	73A140
336.	<b>Safranin T</b>					
336.056	NH <sub>2</sub> ĊHCO <sub>2</sub> <sup>-</sup> + Dye	1.6 × 10 <sup>9</sup> (uncor.)	7	p.r.	D.k. at 520 nm in N <sub>2</sub> O-satd. soln. contg. glycine; 60% <i>e</i> -transfer.	73A078
336.078	(CH <sub>3</sub> ) <sub>2</sub> ĊOH + Dye	2.8 × 10 <sup>9</sup>	7	p.r.	D.k. at 520 nm in N <sub>2</sub> O-satd. soln. contg. 2-PrOH; 86% <i>e</i> -transfer.	73A078
337.	<b>meso-Tetra(4-carboxyphenyl)porphyrin</b>					
337.078	(CH <sub>3</sub> ) <sub>2</sub> ĊOH + H <sub>2</sub> TCPP → H <sub>2</sub> TCPP <sup>-</sup>	(9 ± 1) × 10 <sup>8</sup>	7-11	p.r.	P.b.k. at 460 and 700 nm in N <sub>2</sub> O-satd. soln. contg. 0.2 mol L <sup>-1</sup> 2-PrOH.	79A143
338.	<b>Tetrachlorobenzoquinone (Chloranil)</b>					
338.076	CH <sub>3</sub> ĊHOH + O=C <sub>6</sub> Cl <sub>4</sub> =O → <i>e</i> -transfer	(2.9 to 3.4) × 10 <sup>9</sup>		p.r.	P.b.k. in CTAB or NaLS micelles; soln. contains 0.1 mol L <sup>-1</sup> EtOH; cor. for <i>e</i> <sub>aq</sub> <sup>-</sup> reaction.	76A104
339.	<b>1,2,4,5-Tetracyanobenzene</b>					
339.076	CH <sub>3</sub> ĊHOH + C <sub>6</sub> H <sub>2</sub> (CN) <sub>4</sub> → <i>e</i> -transfer	(3.3 to 4.1) × 10 <sup>9</sup>		p.r.	P.b.k. in CTAB or NaLS micelles; soln. contains 0.1 mol L <sup>-1</sup> EtOH; cor. for <i>e</i> <sub>aq</sub> <sup>-</sup> reaction.	76A104
340.	<b>Tetrahydrofuran</b>					
340.048	·CCl <sub>3</sub> + C <sub>4</sub> H <sub>8</sub> O	57			Calcd. from dependence of <i>G</i> (Cl <sup>-</sup> ) on dose rate in soln. contg. CCl <sub>4</sub> and tetrahydrofuran.	71G778
<i>Tetramethyl-p-benzoquinone See Duroquinone 198.</i>						
<i>N,N,N,N-Tetramethyldiazenedicarboxamide See Diamide 170.</i>						
341.	<b>1,1'-Tetramethylene-2,2'-bipyridinium ion</b>					
341.147	·CO <sub>2</sub> <sup>-</sup> + BP <sup>2+</sup> → CO <sub>2</sub> + ·BP <sup>-</sup>	9.0 × 10 <sup>9</sup> 7 × 10 <sup>9</sup>	7.0 6.8	p.r. p.r.	P.b.k. at 680 nm in N <sub>2</sub> O-satd. soln. contg. 0.2 mol L <sup>-1</sup> formate. P.b.k. in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> formate ion.	76A169 78A321
342.	<b>2,2,6,6-Tetramethyl-4-oxo-1-piperidinyloxy (TAN)</b>					
342.004	<i>c</i> -Ċ <sub>5</sub> H <sub>9</sub> + TAN	(4.0 ± 0.4) × 10 <sup>8</sup>	acid	p.r.	Condy. changes in N <sub>2</sub> O-satd. soln. contg. 10 <sup>-2</sup> mol L <sup>-1</sup> cyclopentane; addn. reaction.	76A067
342.016	·CH <sub>2</sub> C(CH <sub>3</sub> ) <sub>2</sub> OH + TAN	(2.8 ± 0.3) × 10 <sup>8</sup>	2.4	p.r.	Condy. changes in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> <i>tert</i> -BuOH; addn. reaction.	76A067

TABLE 2. Rate constants for reactions of aliphatic radicals with organic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
342.075	·CH <sub>2</sub> OH + TAN	7.2 x 10 <sup>8</sup> (rel.)	5-6	p.r.	C.k. in N <sub>2</sub> O-satd. soln. contg. 1 mol L <sup>-1</sup> MeOH; $k(\cdot\text{CH}_2\text{OH} + \text{ferricyanide}) = 4.0 \times 10^9$ .	71G618
		(7.2 ± 0.7) x 10 <sup>8</sup>	acid	p.r.	Condy. changes in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> MeOH; addn. reaction.	76A067
342.076	CH <sub>3</sub> ĊHOH + TAN	6.4 x 10 <sup>8</sup> (rel.)	5-6	p.r.	C.k. in N <sub>2</sub> O-satd. soln. contg. EtOH assuming $k(\text{R} + \text{ferricyanide}) = 5.3 \times 10^9$ .	71G618
		(4.0 ± 0.4) x 10 <sup>8</sup>	acid	p.r.	Condy. changes in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> EtOH; <i>e</i> -transfer.	76A067
342.078	(CH <sub>3</sub> ) <sub>2</sub> ĊOH + TAN	3.9 x 10 <sup>8</sup> (rel.)	5-6	p.r.	C.k. in N <sub>2</sub> O-satd. soln. contg. 2-PrOH. rel. to $k(\text{R} + \text{ferricyanide}) = 4.7 \times 10^9$ ; $k = 4.7 \times 10^8$ rel. to $k(\text{R} + \text{PNAP}) = 3.8 \times 10^9$ .	71G618
		(4.3 ± 0.4) x 10 <sup>8</sup>	acid	p.r.	Condy. change in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> 2-PrOH; addn. reaction.	76A067
342.105	R + TAN (R = Radicals from polyethylene oxide)	1.9 x 10 <sup>8</sup> (rel.)	5-6	p.r.	C.k. in N <sub>2</sub> O-satd. soln. contg. PEO(20000), rel. to $k(\text{R} + \text{ferricyanide}) = 2.1 \times 10^9$ ; similar values were obtained for PEO(600) and PEO(200).	71G618
342.108	R + TAN (R = Radicals from deoxyribose)	3.9 x 10 <sup>8</sup> (rel.)	5-6	p.r.	C.k. in N <sub>2</sub> O-satd. soln. contg. deoxyribose, rel. to $k(\text{R} + \text{ferricyanide}) = 2.8 \times 10^9$ .	71G618
342.111	R + TAN (R = Radicals from glucose)	<1 x 10 <sup>8</sup> (rel.)	5-6	p.r.	C.k. in N <sub>2</sub> O-satd. soln. contg. glucose, rel. to $k(\text{R} + \text{ferricyanide}) = 1.9 \times 10^9$ .	71G618
		(5.9 ± 0.6) x 10 <sup>7</sup>	acid	p.r.	Condy. change in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> glucose.	76A067
342.147	·CO <sub>2</sub> <sup>-</sup> + TAN	7.0 x 10 <sup>8</sup>	7-8	p.r.	P.b.k. at 310 nm in N <sub>2</sub> O-satd. soln. contg. formate.	71G618
		5.4 x 10 <sup>8</sup> (rel.)	7-8	p.r.	C.k. in N <sub>2</sub> O-satd. soln. contg. formate, rel. to $k(\cdot\text{CO}_2^- + \text{ferricyanide}) = 1.06 \times 10^9$ .	71G618
343.	<b>2,2,6,6-Tetramethyl-4-hydroxy-1-piperidinyloxy (TMPN)</b>					
343.004	c-C <sub>5</sub> H <sub>9</sub> + TMPN	(4.3 ± 0.4) x 10 <sup>8</sup>	acid	p.r.	Condy. change in N <sub>2</sub> O-satd. soln. contg. 10 <sup>-2</sup> mol L <sup>-1</sup> cyclopentane; addn. reaction.	76A067
343.016	·CH <sub>2</sub> C(CH <sub>3</sub> ) <sub>2</sub> OH + TMPN	(1.5 ± 0.2) x 10 <sup>8</sup>	2.6	p.r.	Condy. change in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> <i>tert</i> -BuOH; addn. reaction.	76A067
343.075	·CH <sub>2</sub> OII + TMPN	(4.4 ± 0.4) x 10 <sup>8</sup>	acid	p.r.	Condy. change in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> MeOH; addn. reaction.	76A067
343.076	CH <sub>3</sub> ĊHOH + TMPN	(4.9 ± 0.5) x 10 <sup>8</sup>	acid	p.r.	Condy change in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> EtOH; <i>e</i> -transfer.	76A067
343.078	(CH <sub>3</sub> ) <sub>2</sub> ĊOH + TMPN	(3.6 ± 0.4) x 10 <sup>8</sup>	acid	p.r.	Condy. change in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> 2-PrOH; <i>e</i> -transfer.	76A067
343.111	R + TMPN (R = Radicals from glucose)	(4.9 ± 0.5) x 10 <sup>7</sup>	acid	p.r.	Condy. change in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> glucose; addn. reaction.	76A067
344.	<b>N,N,N',N'-Tetramethyl-p-phenylenediamine</b>					
344.020	·CH <sub>2</sub> CHO + TMPD (+ H <sub>2</sub> O) → CH <sub>3</sub> CHO + TMPD· + OH <sup>-</sup>	2.0 x 10 <sup>9</sup>	~11.5	p.r.	Soln. contg. N <sub>2</sub> O and ethylene glycol; radical cation ident. by abs. spectra.	70A051
345.	<b>2,2,5,5-Tetramethyl-1-pyrrolidinyloxy-3-carboxamide (NX-s)</b>					
345.001	·CH <sub>3</sub> + NX-s	(7.5 ± 0.8) x 10 <sup>8</sup>	3.0	p.r.	Condy. change in N <sub>2</sub> O-satd. soln. contg. 10 <sup>-2</sup> -10 <sup>-1</sup> mol L <sup>-1</sup> dimethyl sulfoxide; addn. reaction.	76A152



TABLE 2. Rate constants for reactions of aliphatic radicals with organic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
345.004	$c\text{-}\dot{\text{C}}_5\text{H}_9 + \text{NX-s}$	$(3.5 \pm 0.4) \times 10^8$	acid	p.r.	Condy. change in N <sub>2</sub> O-satd. soln. contg. 10 <sup>-2</sup> -10 <sup>-1</sup> mol L <sup>-1</sup> cyclopentane; addn. reaction.	76A152
345.014	$\cdot\text{CH}_2\text{CH}_2\text{OH} + \text{NX-s}$	$(4.7 \pm 0.5) \times 10^8$	acid	p.r.	Condy. change in N <sub>2</sub> O-satd. soln. contg. 10 <sup>-2</sup> -10 <sup>-1</sup> mol L <sup>-1</sup> ethylene; addn. reaction.	76A152
345.016	$\cdot\text{CH}_2\text{C}(\text{CH}_3)_2\text{OH} + \text{NX-s}$	$(1.8 \pm 0.2) \times 10^8$	acid	p.r.	Condy. change in N <sub>2</sub> O-satd. soln. contg. 10 <sup>-2</sup> -10 <sup>-1</sup> mol L <sup>-1</sup> <i>tert</i> -BuOH; addn. reaction.	76A152
345.075	$\cdot\text{CH}_2\text{OH} + \text{NX-s}$	$(4.6 \pm 0.5) \times 10^8$	acid	p.r.	Condy. change in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> MeOH; addn. reaction.	76A152
345.076	$\text{CH}_3\dot{\text{C}}\text{HOH} + \text{NX-s}$	$(4.3 \pm 0.4) \times 10^8$	acid	p.r.	Condy. change in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> EtOH; <i>e</i> -transfer.	76A152
345.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{NX-s}$	$(3.3 \pm 0.3) \times 10^8$	acid	p.r.	Condy. change in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> 2-PrOH; <i>e</i> -transfer.	76A152
345.111	$\text{R} + \text{NX-s}$ (R = Radicals from glucose)	$(5.1 \pm 0.5) \times 10^7$	acid	p.r.	Condy. change in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> glucose; <i>e</i> -transfer.	76A152
346.	<b>2,2,5,5-Tetramethyl-3-pyrrolin-1-yloxy-3-carboxamide (NX-u)</b>					
346.001	$\cdot\text{CH}_3 + \text{NX-u}$	$(7.8 \pm 0.8) \times 10^8$	acid.	p.r.	Condy. change in N <sub>2</sub> O-satd. soln. contg. 10 <sup>-2</sup> -10 <sup>-1</sup> mol L <sup>-1</sup> dimethyl sulfoxide; addn. reaction.	76A152
346.004	$c\text{-}\dot{\text{C}}_5\text{H}_9 + \text{NX-u}$	$(3.6 \pm 0.4) \times 10^8$	acid	p.r.	Condy. change in N <sub>2</sub> O-satd. soln. contg. 10 <sup>-2</sup> -10 <sup>-1</sup> mol L <sup>-1</sup> cyclopentane; addn. reaction.	76A152
346.014	$\cdot\text{CH}_2\text{CH}_2\text{OH} + \text{NX-u}$	$(4.8 \pm 0.5) \times 10^8$	acid	p.r.	Condy. change in N <sub>2</sub> O-satd. soln. contg. 10 <sup>-2</sup> -10 <sup>-1</sup> mol L <sup>-1</sup> ethylene; addn. reaction.	76A152
346.016	$\cdot\text{CH}_2\text{C}(\text{CH}_3)_2\text{OH} + \text{NX-u}$	$(2.0 \pm 0.2) \times 10^8$	acid	p.r.	Condy. change in N <sub>2</sub> O-satd. soln. contg. 10 <sup>-2</sup> -10 <sup>-1</sup> mol L <sup>-1</sup> <i>tert</i> -BuOH; addn. reaction.	76A152
346.075	$\cdot\text{CH}_2\text{OH} + \text{NX-u}$	$(3.5 \pm 0.4) \times 10^8$	acid	p.r.	Condy. change in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> MeOH; addn. reaction.	76A152
346.076	$\text{CH}_3\dot{\text{C}}\text{HOH} + \text{NX-u}$	$(6.2 \pm 0.6) \times 10^8$	acid	p.r.	Condy. change in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> EtOH; <i>e</i> -transfer.	76A152
346.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{NX-u}$	$(3.6 \pm 0.4) \times 10^8$	acid	p.r.	Condy. change in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> 2-PrOH; <i>e</i> -transfer.	76A152
346.111	$\text{R} + \text{NX-u}$ (R = Radicals from glucose)	$(4.3 \pm 0.4) \times 10^7$	acid	p.r.	Condy. chnge in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> glucose; <i>e</i> -transfer.	76A152
347.	<b>Tetranitromethane</b>					
347.075	$\cdot\text{CH}_2\text{OH} + \text{C}(\text{NO}_2)_4 \rightarrow$ $\text{CH}_2\text{O} + \text{NO}_2 + \text{H}^+ + \text{C}(\text{NO}_2)_3^-$	$(5.0 \pm 1) \times 10^9$		p.r.	P.b.k. at 350 nm in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> MeOH.	64G133
347.076	$\text{CH}_3\dot{\text{C}}\text{HOH} + \text{C}(\text{NO}_2)_4 \rightarrow$ $\text{CH}_3\text{CHO} + \text{NO}_2 + \text{H}^+ + \text{C}(\text{NO}_2)_3^-$	$5.6 \times 10^9$	~1	p.r.	P.b.k. at 366 nm in soln. contg. 0.5 mol L <sup>-1</sup> EtOH.	65G183
		$\sim 3.5 \times 10^9$		p.r.	P.b.k. in solns. contg. 0.1 mol L <sup>-1</sup> EtOH and either 0.1 mol L <sup>-1</sup> Na dodecyl sulfate or 0.02 mol L <sup>-1</sup> dodecyltrimethylammonium chloride.	76A104
347.077	$\text{CH}_3\text{CH}_2\dot{\text{C}}\text{HOH} + \text{C}(\text{NO}_2)_4 \rightarrow$ $\text{CH}_3\text{CH}_2\text{CHO} + \text{NO}_2 + \text{H}^+$ $+ \text{C}(\text{NO}_2)_3^-$	$(4.7 \pm 1) \times 10^9$		p.r.	P.b.k. at 350 nm in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> 1-PrOH.	64G133
347.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{C}(\text{NO}_2)_4 \rightarrow$ $(\text{CH}_3)_2\text{CO} + \text{H}^+ + \text{NO}_2 + \text{C}(\text{NO}_2)_3^-$	$(5.0 \pm 1) \times 10^9$		p.r.	P.b.k. at 350 nm in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> 2-PrOH.	64G133
347.092a	$\cdot\text{CH}_2\text{OCH}_3 + \text{C}(\text{NO}_2)_4 \rightarrow$ $\text{CH}_3\text{OCH}_2\text{O}\dot{\text{N}}^+(\text{O}^-)\text{C}(\text{NO}_2)_3 \leftrightarrow$ $\text{CH}_3\text{OCH}_2\text{ON}(\text{O})\text{C}(\text{NO}_2)_3$	$6 \times 10^9$		p.r.	P.b.k. at 300 nm in N <sub>2</sub> O-satd. soln. contg. 0.05 mol L <sup>-1</sup> methyl ether; adduct decomposes to nitroform anion, $k = 1.1 \times 10^4 \text{ s}^{-1}$ .	80A071
347.093	$\text{CH}_3\text{CH}_2\text{O}\dot{\text{C}}\text{HCH}_3 + \text{C}(\text{NO}_2)_4 \rightarrow$ $\text{C}(\text{NO}_2)_3^-$	$\sim 4 \times 10^9$		p.r.	P.b.k. at 350 nm in N <sub>2</sub> O-satd. soln. contg. ethyl ether.	80A071
347.093a	$\cdot\text{CH}_2\text{OC}(\text{CH}_3)_3 + \text{C}(\text{NO}_2)_4 \rightarrow$ $\text{C}(\text{NO}_2)_3^-$	$\sim 3 \times 10^9$		p.r.	P.b.k. at 350 nm in N <sub>2</sub> O-satd. soln. contg. methyl <i>tert</i> -butyl ether.	80A071

TABLE 2. Rate constants for reactions of aliphatic radicals with organic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
347.094a	$\cdot\text{CH}_2\text{OCH}_2\text{OCH}_3 + \text{C}(\text{NO}_2)_4 \rightarrow$ $\text{CH}_3\text{OCH}_2\text{OCH}_2\text{ON}(\text{O})\text{C}(\text{NO}_2)_3$	$5 \times 10^9$	4–13	p.r.	P.b.k. at 300 nm in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> dimethoxymethane; adduct decomposes to nitroform anion ( $\lambda$ 350 nm), $k = 8.2 \times 10^2$ s <sup>-1</sup> .	80A071
347.101	$\text{CH}_2\text{OH}\dot{\text{C}}\text{HOH} + \text{C}(\text{NO}_2)_4$	$1.7 \times 10^9$		p.r.	P.b.k. in soln. contg. 0.2 mol L <sup>-1</sup> ethylene glycol.	73G126
347.102	$\text{CH}_3\text{CHOH}\dot{\text{C}}\text{HOH} + \text{C}(\text{NO}_2)_4$	$3.2 \times 10^9$		p.r.	P.b.k. in soln. contg. 0.2 mol L <sup>-1</sup> 1,2-propanediol.	73G126
347.103	$\text{CH}_3\text{CHOH}\dot{\text{C}}\text{OHCH}_3 + \text{C}(\text{NO}_2)_4$	$3.3 \times 10^9$		p.r.	P.b.k. in soln. contg. 0.2 mol L <sup>-1</sup> 2,3-butanediol.	73G126
347.106	$\text{CH}_2\text{OHCHOH}\dot{\text{C}}\text{HOH} + \text{C}(\text{NO}_2)_4$ (+ $\text{CH}_2\text{OH}\dot{\text{C}}\text{OHCH}_2\text{OH}$ )	$(2.4 \pm 0.3) \times 10^9$		p.r.	P.b.k. at 350 nm in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> glycerol.	64G133
347.111	R + C(NO <sub>2</sub> ) <sub>4</sub> (R = Radicals from glucose)	$2.6 \times 10^9$		p.r.	P.b.k. at 366 nm in N <sub>2</sub> O-satd. soln. 0.25 mol L <sup>-1</sup> glucose.	65G183
347.112	R + C(NO <sub>2</sub> ) <sub>4</sub> (R = Radicals from sucrose)	$(7.0 \pm 1) \times 10^8$		p.r.	P.b.k. at 350 nm in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> sucrose.	64G133
		$(8.5 \pm 1) \times 10^8$		p.r.	P.b.k. in soln. contg. 0.1 or 0.01 mol L <sup>-1</sup> sucrose.	65G183
347.147	$\cdot\text{CO}_2^- + \text{C}(\text{NO}_2)_4$	$(4 \pm 1) \times 10^9$		p.r.	P.b.k.; independent of pH between 3 and 7.	70G303
348.	<b>Thiamine</b>					
348.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{TmH}^+ \rightarrow$ $(\text{CH}_3)_2\dot{\text{C}}\text{O} + \cdot\text{TmH}_2^+$	$2.2 \times 10^8$	0.5	p.r.	P.b.k. in soln. contg. 2-PrOH.	77A034
	$(\text{CH}_2)_2\dot{\text{C}}\text{OH} + \text{Tm} \rightarrow$ $(\text{CH}_3)_2\dot{\text{C}}\text{O} + \cdot\text{TmH}^+$	$1.9 \times 10^8$	6.6	p.r.	P.b.k. in soln. contg. 2-PrOH.	77A034
349.	<b>Thiazole</b>					
349.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{C}_3\text{H}_3\text{SNH}^+ \rightarrow$ $(\text{CH}_3)_2\dot{\text{C}}\text{O} + \cdot\text{C}_3\text{H}_3\text{SNH}_2^+$	$6.2 \times 10^8$	0.8	p.r.	P.b.k. in soln. contg. 2-PrOH.	77A034
	$(\text{CH}_3)_2\dot{\text{C}}\text{O}^- + \text{C}_3\text{H}_3\text{SN}$		13.3	p.r.	No electron transfer.	77A034
350.	<b>Thionine</b>					
350.056	$\text{NH}_2\dot{\text{C}}\text{HCO}_2^- + \text{Dye}$	$3.2 \times 10^9$	8	p.r.	D.k. at 600 nm in N <sub>2</sub> O-satd. soln. contg. glycine; 85% <i>e</i> -transfer.	73A078
350.075	$\cdot\text{CH}_2\text{OH} + \text{Dye}$	$2.6 \times 10^9$	8	p.r.	D.k. at 600 nm in N <sub>2</sub> O-satd. soln. contg. MeOH; 86% <i>e</i> -transfer.	73A078
350.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{Dye}$	$4.2 \times 10^9$	8	p.r.	D.k. at 600 nm in N <sub>2</sub> O-satd. soln. contg. 2-PrOH; 88% <i>e</i> -transfer.	73A078
351.	<b>Trichloroacetate ion</b>					
351.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{CCl}_3\text{CO}_2^-$	$5 \times 10^6$ (rel.)		p.r.	C.k. in soln. contg. 2-PrOH and acetone; rel. to $k(\text{R} + \text{PNAP}) = 3.8 \times 10^9$ .	73A140
	$(\text{CH}_3)_2\dot{\text{C}}\text{O}^- + \text{CCl}_3\text{CO}_2^-$	$3 \times 10^8$ (rel.)	13	p.r.	C.k. in soln. contg. 2-PrOH and acetone; rel. to $k(\text{R} + \text{PNAP}) = 3.8 \times 10^9$ .	73A140
352.	<b>Trifluoroacetate ion</b>					
352.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{CF}_3\text{CO}_2^-$	$<1 \times 10^8$ (rel.)		p.r.	C.k. in soln. contg. 2-PrOH and acetone; rel. to $k(\text{R} + \text{PNAP}) = 3.8 \times 10^9$ .	73A140
353.	<b>2,3,5-Trimethylbenzoquinone</b>					
353.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{Q} \rightarrow$ $(\text{CH}_3)_2\dot{\text{C}}\text{O} + \text{H}^+ + \cdot\text{Q}^+$	$3.6 \times 10^9$	7	p.r.	P.b.k. in soln. contg. 1 mol L <sup>-1</sup> 2-PrOH and 1 mol L <sup>-1</sup> acetone.	73G125
354.	<b>1,1'-Trimethylene-2,2'-bipyridinium ion</b>					
354.147	$\cdot\text{CO}_2^- + \text{BP}^{2+} \rightarrow \text{CO}_2 + \cdot\text{BP}^+$	$7.5 \times 10^9$	7.0	p.r.	P.b.k. at 680 nm in N <sub>2</sub> O-satd. soln. contg. 0.2 mol L <sup>-1</sup> formate ion.	76A169
		$1.1 \times 10^{10}$	6.8	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> formate.	78A321

TABLE 2. Rate constants for reactions of aliphatic radicals with organic solutes in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
355.	<b>Trinitrobenzenesulfonate ion</b>					
355.111	R + (NO <sub>2</sub> ) <sub>3</sub> C <sub>6</sub> H <sub>2</sub> SO <sub>3</sub> <sup>-</sup> (R = Radicals from glucose)	1.1 x 10 <sup>9</sup>		p.r.		77R167
356.	<b>2,4,6-Trinitrobenzoate ion</b>					
356.078	(CH <sub>3</sub> ) <sub>2</sub> ĊOH + (NO <sub>2</sub> ) <sub>3</sub> C <sub>6</sub> H <sub>2</sub> CO <sub>2</sub> <sup>-</sup> → (CH <sub>3</sub> ) <sub>2</sub> CO + H <sup>+</sup> + (NO <sub>2</sub> ) <sub>3</sub> C <sub>6</sub> H <sub>2</sub> CO <sub>2</sub> <sup>-</sup>	3.9 x 10 <sup>9</sup>	7	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. 2-PrOH; $k$ at pH 0.8 within 20-30%.	76A111
356.147	·CO <sub>2</sub> <sup>-</sup> + (NO <sub>2</sub> ) <sub>3</sub> C <sub>6</sub> H <sub>2</sub> CO <sub>2</sub> <sup>-</sup>	3.4 x 10 <sup>9</sup>	7	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. formate; $k$ at pH 0.8 within 20-30%.	76A111
357.	<b>Trypan blue</b>					
357.078	(CH <sub>3</sub> ) <sub>2</sub> ĊOH + Dye	(3 ± 1.5) x 10 <sup>9</sup>		p.r.		73A150
358.	<b>Tyrosine</b>					
358.048	·CCl <sub>3</sub> + ArO <sup>-</sup>	slow	12	p.r.	Suggested that fast reaction is CCl <sub>3</sub> O <sub>2</sub> + ArO <sup>-</sup> → ArO· ( $k$ = 1.6 x 10 <sup>9</sup> ) and ·CCl <sub>3</sub> is less reactive.	78B128 80A053
359.	<b>Ubiquinone</b>					
359.078	(CH <sub>3</sub> ) <sub>2</sub> ĊOH + Q → (CH <sub>3</sub> ) <sub>2</sub> CO + ·Q <sup>-</sup> + H <sup>+</sup>	1.9 x 10 <sup>9</sup>	7	p.r.	P.b.k. in soln. contg. 7 mol L <sup>-1</sup> 2-PrOH and 1 mol L <sup>-1</sup> acetone.	73G125
	<i>Vitamin B<sub>5</sub> See Nicotinamide 275.</i>					
	<i>Vitamin B<sub>12</sub> See Cyanocobalamin (under Cobalt(III) ions) 53.</i>					
	<i>Vitamin B<sub>12a</sub> See Hydroxocobalamin (under Cobalt(III) ions) 54.</i>					
	<i>Vitamin B<sub>12r</sub> See Cobalamin (under Cobalt(II) ions) 10.</i>					
360.	<b>Vitamin K<sub>1</sub></b>					
360.078	(CH <sub>3</sub> ) <sub>2</sub> ĊOH + Q → (CH <sub>3</sub> ) <sub>2</sub> CO + ·Q <sup>-</sup> + H <sup>+</sup>	1.7 x 10 <sup>9</sup>	7	p.r.	P.b.k. in soln. contg. 5 mol L <sup>-1</sup> 2-PrOH and 2 mol L <sup>-1</sup> acetone.	73G125
	<i>Vitamin K<sub>3</sub> See 2-Methyl-1,4-naphthoquinone 262.</i>					

TABLE 3. Rate constants for acid- and base-catalyzed proton transfer reactions of aliphatic radicals in aqueous solution

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
361.	<b>Hydronium ion</b>					
361.075	$\cdot\text{CH}_2\text{OH} + \text{H}_3\text{O}^+ \rightleftharpoons \cdot\text{CH}_2\text{OH}_2^+ + \text{H}_2\text{O}$	$k_f = 1.76 \times 10^8$ $k_r = 3.6 \times 10^7$		chem. phot.	Esr; radicals from Ti(III)-H <sub>2</sub> O <sub>2</sub> -MeOH. Esr; soln. contg. 10% acetone and 5% MeOH.	65D040 66D162
		$k_f = (3.19 \pm 0.04) \times 10^7$		chem.	Esr; radicals from Ti(III)-H <sub>2</sub> O <sub>2</sub> -MeOH at 30.4°C; $E_a = 2.8 \pm 5$ kcal mol <sup>-1</sup> (11.7 kJ mol <sup>-1</sup> ) at 5.7-41°C; $A = 9.5$ s <sup>-1</sup> .	68M058
361.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{H}_3\text{O}^+ \rightleftharpoons (\text{CH}_3)_2\dot{\text{C}}\text{OH}_2^+ + \text{H}_2\text{O}$	$k_f = 7.2 \times 10^7$		phot.	Esr; soln. contg. 10% acetone and 5% 2-PrOH.	66D162
		$k_f = (6.44 \pm 0.30) \times 10^7$		chem.	Esr; radicals from Ti(III)-H <sub>2</sub> O <sub>2</sub> -2-PrOH.	68M058
361.148	$\text{CH}_3\dot{\text{C}}(\text{O})\text{OCH}_3 + \text{H}_3\text{O}^+ \rightarrow \text{CH}_3\dot{\text{C}}(\text{OH})\text{OCH}_3 + \text{H}_2\text{O}$	$1.4 \times 10^{10}$		p.r.	D.k. at 360 nm in soln. contg. methyl acetate and HClO <sub>4</sub> (1-5 x 10 <sup>-5</sup> mol L <sup>-1</sup> ).	78A402
362.	<b>Hydroxide ion</b>					
362.022	$\cdot\text{CH}=\text{CHOH} + \text{OH}^- \rightleftharpoons [\cdot\text{CH}=\text{CHO}] + \text{H}_2\text{O}$	$k_f = (1.5 \pm 0.3) \times 10^{10}$	9.4-10	p.r.	D.k. at 260 nm in 10 <sup>-3</sup> mol L <sup>-1</sup> acetylene soln.; hydrolysis product is formylmethyl radical.	78A007
362.060	$\text{CH}_3\text{CONH}\dot{\text{C}}\text{HCOO}^- + \text{OH}^- \rightleftharpoons \text{CH}_3\text{CON}^-\dot{\text{C}}\text{HCOO}^- + \text{H}_2\text{O}$	$k_f = (8 \pm 2) \times 10^8$	>13	e-r.	Est. by esr from pH dependence of line width in N <sub>2</sub> O-satd. soln. contg. acetylglycine; $k_f = 1.6 \times 10^7$ ; (pK <sub>a</sub> = 14.0).	76D198
362.062	$\text{R}(\text{NH}) + \text{OH}^- \rightleftharpoons \text{R}(\text{N}^-) + \text{H}_2\text{O}$ (R = Radicals from glycine anhydride)	$\sim (8 \pm 2) \times 10^9$	$\sim 9.2$ - 10.5	p.r.	P.b.k. at 300 nm in N <sub>2</sub> O-satd. soln. contg. 4 x 10 <sup>-3</sup> mol L <sup>-1</sup> glycine anhydride.	71G554
362.063	$\text{R}(\text{NH}) + \text{OH}^- \rightleftharpoons \text{R}(\text{N}^-) + \text{H}_2\text{O}$ (R = Radicals from alanine anhydride)	$\sim (1.1 \pm 0.2) \times 10^{10}$	$\sim 9.2$ - 10.5	p.r.	P.b.k. at 300 nm in N <sub>2</sub> O-satd. soln. contg. 4 x 10 <sup>-3</sup> mol L <sup>-1</sup> alanine anhydride.	71G554
362.074	$-(\text{CH}_2)_2\text{CONH}\dot{\text{C}}(\text{COO})^- + \text{OH}^- \rightleftharpoons -(\text{CH}_2)_2\text{CON}^-\dot{\text{C}}(\text{COO})^- + \text{H}_2\text{O}$	$k_f = 1 \times 10^9$		e-r.	Est. by esr from pH dependence of line width in N <sub>2</sub> O-satd. soln. contg. 2-pyrrolidone-5-carboxylic acid; (pK <sub>a</sub> = 12.7).	77D087
362.076	$\text{CH}_3\dot{\text{C}}\text{HOH} + \text{OH}^- \rightleftharpoons \text{CH}_3\dot{\text{C}}\text{HO}^- + \text{H}_2\text{O}$	$k_f = 7 \times 10^9$	11-12	e-r.	Esr line broadening in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> EtOH; $k_f = 4.1 \times 10^9$ (pK <sub>a</sub> = 11.51).	73D065
362.078	$(\text{CH}_3)_2\dot{\text{C}}\text{OH} + \text{OH}^- \rightleftharpoons (\text{CH}_3)_2\dot{\text{C}}\text{O}^- + \text{H}_2\text{O}$	$k_f = 9 \times 10^9$	11-12	e-r.	Esr line broadening in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> 2-PrOH; $k_f = 1.8 \times 10^9$ (pK <sub>a</sub> = 12.03).	73D065
		$k_f = 7.5 \times 10^9$	10.4- 11.0	p.r.	Condy. in soln. contg. 1 mol L <sup>-1</sup> acetone gave $k_f = (1.4 \pm 0.1) \times 10^6$ ; $k_f$ calcd. from pK <sub>a</sub> = 12.00.	80A323
362.101	$\cdot\text{CHOHCH}_2\text{OH} + \text{OH}^- \rightarrow [\cdot\text{CHO}^-\text{CH}_2\text{OH}] + \text{H}_2\text{O} \rightarrow \cdot\text{CH}_2\text{CHO} + \text{OH}^-$	$\sim 10^{10}$	10	p.r.	Absorption spectrum immediately after pulse in N <sub>2</sub> O-satd. soln. contg. ethylene glycol decays in < 10 μs to formylmethyl spectrum.	73G004
362.114	$\cdot\text{CHOHCONH}_2 + \text{OH}^- \rightleftharpoons \cdot\text{CHO}^-\text{CONH}_2 + \text{H}_2\text{O}$	$k_f = 1.1 \times 10^{10}$	8.3- 9.9	p.r.	Calcd. from effect of [OH <sup>-</sup> ] in buffer soln. on d.k. at 290 nm in N <sub>2</sub> O-satd. soln. contg. glycolamide; cor. to I = 0.	75A053
362.115	$\cdot\text{CHOHCO}_2^- + \text{OH}^- \rightleftharpoons \cdot\text{CHO}^-\text{CO}_2^- + \text{H}_2\text{O}$	$k_f = 3.9 \times 10^9$	9.5- 10.5	p.r.	Calcd. from effect of [OH <sup>-</sup> ] in buffer soln. on d.k. at 270 nm in N <sub>2</sub> O-satd. glycolate soln.; cor. to I = 0; $k_f = (3.1 \pm 0.4) \times 10^9$ in unbuffered soln.	75A053
362.116	$\cdot\text{COH}(\text{CH}_3)\text{CONH}_2 + \text{OH}^- \rightleftharpoons \cdot\text{CO}^-(\text{CH}_3)\text{CONH}_2 + \text{H}_2\text{O}$	$k_f = 1.1 \times 10^{10}$	8.0- 10.2	p.r.	Calcd. from effect of [OH <sup>-</sup> ] in buffer soln. on d.k. at 300 nm in N <sub>2</sub> O-satd. lactamide soln.; cor. to I = 0.	75A053

TABLE 3. Rate constants for acid- and base-catalyzed proton transfer reactions of aliphatic radicals in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
362.134	$[\text{CH}_2\text{CHCO}_2\text{H}]^- + \text{OH}^-$	$7.7 \times 10^8$	>7	p.r.	Calcd. from effect of $[\text{OH}^-]$ on d.k. in acrylate soln.; cor. to $I = 0$ ; for mechanism and evidence for protonation at the $\beta$ position see 74G033.	76A113
362.135	$[\text{CH}_3\text{CHCHCO}_2\text{H}]^- + \text{OH}^- \rightarrow$ $\text{CH}_3\text{CH}_2\dot{\text{C}}\text{HCO}_2^- + \text{OH}^-$	$\sim 1.2 \times 10^8$	>7.5	p.r.	Calcd. from effect of $[\text{OH}^-]$ on d.k. in <i>trans</i> -crotonate soln.; cor. to $I = 0$ .	76A113
362.136	$[\text{CH}_2\text{C}(\text{CH}_3)\text{CO}_2\text{H}]^- + \text{OH}^- \rightarrow$ $(\text{CH}_3)_2\dot{\text{C}}\text{CO}_2^- + \text{OH}^-$	$8 \times 10^8$	>5.3	p.r.	Calcd. from effect of $[\text{OH}^-]$ on d.k. in soln. contg. methacrylate; cor. to $I = 0$ .	76A113
362.137	$[(\text{CH}_3)_2\text{CCHCO}_2\text{H}]^- + \text{OH}^- \rightarrow$ $(\text{CH}_3)_2\text{CH}\dot{\text{C}}\text{CO}_2^- + \text{OH}^-$	$3 \times 10^6$	>8.0	p.r.	Calcd. from effect of $[\text{OH}^-]$ on d.k. in $\beta,\beta$ -dimethylacrylate soln.; cor. to $I = 0$ .	76A113
362.139	$[\text{CH}_3\text{CHCHCHCHCO}_2\text{H}]^- + \text{OH}^-$	$\sim 2 \times 10^7$	>6.4	p.r.	Calcd. from effect of $[\text{OH}^-]$ on d.k. in soln. contg. sorbate; cor. to $I = 0$ .	76A113
363.	<b>Water</b>					
363.128	$[\text{CH}_2\text{CHCONH}_2]^- + \text{H}_2\text{O} \rightarrow$ $\text{CH}_3\dot{\text{C}}\text{HCONH}_2 + \text{OH}^-$	$1.4 \times 10^5 \text{ s}^{-1}$	9.3– 13	p.r.	D.k. in acrylamide soln contg. $10^{-3}$ mol L <sup>-1</sup> borate buffer; general acid catalysis by buffer components, e.g. $\text{B}(\text{OH})_3$ , $\text{NH}_4^+$ , $(\text{CH}_3)_3\text{NH}^+$ , $\text{HCO}_3^-$ , $\text{HPO}_4^{2-}$ , etc.	75A052
363.129	$[\text{CH}_3\text{CHCHCONH}_2]^- + \text{H}_2\text{O} \rightarrow$ $\text{CH}_3\text{CH}_2\dot{\text{C}}\text{HCONH}_2 + \text{OH}^-$	$2 \times 10^4 \text{ s}^{-1}$	10.2	p.r.	D.k. in <i>trans</i> -crotonamide soln. contg. borate buffer, as above.	75A052
363.130	$[\text{CH}_2\text{C}(\text{CH}_3)\text{CONH}_2]^- + \text{H}_2\text{O} \rightarrow$ $\text{CH}_3\dot{\text{C}}(\text{CH}_3)\text{CONH}_2 + \text{OH}^-$	$1.3 \times 10^6 \text{ s}^{-1}$	10–13	p.r.	D.k. in methacrylamide soln. contg. borate buffer, as above.	75A052
363.131	$[(\text{CH}_3)_2\text{CCHCONH}_2]^- + \text{H}_2\text{O} \rightarrow$ $(\text{CH}_3)_2\text{CH}\dot{\text{C}}\text{HCONH}_2 + \text{OH}^-$	$2 \times 10^4 \text{ s}^{-1}$	10.2	p.r.	D.k. in $\beta,\beta$ -dimethylacrylamide soln. cor. to $I = 0$ .	75A052
363.132	$[\text{CH}_2\text{CHCON}(\text{CH}_3)_2]^- + \text{H}_2\text{O} \rightarrow$ $\text{CH}_3\dot{\text{C}}\text{HCON}(\text{CH}_3)_2 + \text{OH}^-$	$3.7 \times 10^5 \text{ s}^{-1}$	10	p.r.	D.k. in <i>N,N</i> -dimethylacrylamide soln. contg. borate buffer, as above.	75A052
363.134	$[\text{CH}_2\text{CHCO}_2\text{H}]^- + \text{H}_2\text{O}$	$4.0 \times 10^4 \text{ s}^{-1}$ $3.0 \times 10^4 \text{ s}^{-1}$	6.0 9.5	p.r.	D.k. in acrylate soln.; extrapolated to zero concn. of buffer.	76A113
363.135	$[\text{CH}_3\text{CHCHCO}_2\text{H}]^- + \text{H}_2\text{O} \rightarrow$ $\text{CH}_3\text{CH}_2\dot{\text{C}}\text{HCO}_2^- + \text{H}_2\text{O}$	$1.0 \times 10^4 \text{ s}^{-1}$	10.4	p.r.	D.k. in crotonate soln.; extrapolated to zero concn. of buffer.	76A113
363.136	$[\text{CH}_2\text{C}(\text{CH}_3)\text{CO}_2\text{H}]^- + \text{H}_2\text{O} \rightarrow$ $\text{CH}_3\dot{\text{C}}(\text{CH}_3)\text{CO}_2^- + \text{H}_2\text{O}$	$2.0 \times 10^5 \text{ s}^{-1}$	9.0	p.r.	D.k. in methacrylate soln.; extrapolated to zero concn. of buffer.	76A113
363.137	$[(\text{CH}_3)_2\text{CCHCO}_2\text{H}]^- + \text{H}_2\text{O} \rightarrow$ $(\text{CH}_3)_2\text{CH}\dot{\text{C}}\text{HCO}_2^- + \text{H}_2\text{O}$	$9 \times 10^3 \text{ s}^{-1}$	11.0	p.r.	D.k. in $\beta,\beta$ -dimethylacrylate soln.; extrapolated to zero concn. of buffer.	76A113
363.138	$[\text{CH}_2\text{C}(\text{CH}_3)\text{CO}_2\text{CH}_3]^- + \text{H}_2\text{O} \rightarrow$ $\text{CH}_3\dot{\text{C}}(\text{CH}_3)\text{CO}_2\text{CH}_3 + \text{OH}^-$	$4.5 \times 10^5 \text{ s}^{-1}$	9.8– 12.8	p.r.	D.k. in methyl methacrylate soln. contg. borate buffer; see 363.128.	75A052
363.139	$[\text{CH}_3\text{CHCHCHCHCO}_2\text{H}]^- + \text{H}_2\text{O}$	$5.0 \times 10^4 \text{ s}^{-1}$	11.1	p.r.	D.k. in sorbate soln.; extrapolated to zero concn. of buffer.	76A113
364.	<b>Ammonium ion</b>					
364.128	$[\text{CH}_2\text{CHCONH}_2]^- + \text{NH}_4^+ \rightarrow$ $\text{CH}_3\dot{\text{C}}\text{HCONH}_2 + \text{NH}_3$	$9.5 \times 10^6$		p.r.	D.k. in soln. contg. acrylamide; cor. to $I = 0$ .	75A052 74A182
364.134	$[\text{CH}_2\text{CHCO}_2\text{H}]^- + \text{NH}_4^+ \rightarrow$ $\text{CH}_3\dot{\text{C}}\text{HCO}_2^- + \text{NH}_4^+$	$1.8 \times 10^6$	>7	p.r.	Calcd. from effect of $[\text{NH}_4^+]$ on d.k. in acrylate soln.; cor. to $I = 0$ .	76A113
365.	<b>Ammonia</b>					
365.114	$\cdot\text{CHOHCONH}_2 + \text{NH}_3 \rightleftharpoons$ $\cdot\text{CHO}^-\text{CONH}_2 + \text{NH}_4^+$	$k_t = 1.2 \times 10^9$	8.05, 8.25	p.r.	Calcd. from effect of $[\text{NH}_3]$ in buffer soln. on d.k. at 290 nm in $\text{N}_2\text{O}$ -satd. glycolamide soln.; cor. to $I = 0$ .	75A053
365.115	$\cdot\text{CHOHCO}_2^- + \text{NH}_3 \rightleftharpoons$ $\cdot\text{CHO}^-\text{CO}_2^- + \text{NH}_4^+$	$k_t = 7.5 \times 10^8$	9.26, 9.75	p.r.	Calcd. from effect of $[\text{NH}_3]$ in buffer soln. on d.k. at 270 nm in $\text{N}_2\text{O}$ -satd. glycolate soln.; cor. to $I = 0$ .	75A053

TABLE 3. Rate constants for acid- and base-catalyzed proton transfer reactions of aliphatic radicals in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
365.116	$\cdot\text{COH}(\text{CH}_3)\text{CONH}_2 + \text{NH}_3 \rightleftharpoons \cdot\text{CO}^-(\text{CH}_3)\text{CONH}_2 + \text{NH}_4^+$	$k_t = 9.7 \times 10^8$	8.05	p.r.	Calcd. from effect of $[\text{NH}_3]$ in buffer soln. on d.k. at 300 nm in $\text{N}_2\text{O}$ -satd. lactamide soln.; cor. to $I = 0$ .	75A053
365.134	$[\text{CH}_2\text{CHCO}_2\text{H}]^- + \text{NH}_3 \rightarrow \text{CH}_3\dot{\text{C}}\text{HCO}_2^- + \text{NH}_3$	$(2.8 \pm 1.0) \times 10^6$	>7	p.r.	Calcd. from effect of $[\text{NH}_3]$ on d.k. in acrylate soln.; cor. to $I = 0$ .	76A113
366.	<b>Tetrahydroborate ion</b>					
366.114	$\cdot\text{CHOHCONH}_2 + \text{B}(\text{OH})_4^- \rightleftharpoons \cdot\text{CHO}^-\text{CONH}_2 + \text{B}(\text{OH})_3 + \text{H}_2\text{O}$	$9.1 \times 10^8$	8.25	p.r.	Calcd. from effect of borate on d.k. at 290 nm in $\text{N}_2\text{O}$ -satd. soln. contg. glycolamide; cor. to $I = 0$ .	75A053
366.115	$\cdot\text{CHOHCOO}^- + \text{B}(\text{OH})_4^- \rightleftharpoons \cdot\text{CHO}^-\text{COO}^- + \text{B}(\text{OH})_3 + \text{H}_2\text{O}$	$1.4 \times 10^7$	9.16, 9.75	p.r.	Calcd. from effect of borate on d.k. at 270 nm in $\text{N}_2\text{O}$ -satd. soln. contg. glycolate; cor. to $I = 0$ .	75A053
366.116	$\cdot\text{COH}(\text{CH}_3)\text{CONH}_2 + \text{B}(\text{OH})_4^- \rightleftharpoons \cdot\text{CO}^-(\text{CH}_3)\text{CONH}_2 + \text{B}(\text{OH})_3 + \text{H}_2\text{O}$	$3.1 \times 10^8$	8.30	p.r.	Calcd. from effect of borate on d.k. at 300 nm in $\text{N}_2\text{O}$ -satd. soln. contg. lactamide; cor. to $I = 0$ .	75A053
366.134	$[\text{CH}_2\text{CHCO}_2\text{H}]^- + \text{B}(\text{OH})_4^- \rightarrow \text{CH}_3\dot{\text{C}}\text{HCO}_2^- + \text{B}(\text{OH})_4^-$	$2.3 \times 10^5$	>7	p.r.	Calcd. from effect of borate on d.k. in acrylate soln.; cor. to $I = 0$ .	76A113
367.	<b>Boric acid</b>					
367.128	$[\text{CH}_2\text{CHCONH}_2]^- + \text{B}(\text{OH})_3 + \text{H}_2\text{O} \rightarrow \text{CH}_3\dot{\text{C}}\text{HCONH}_2 + \text{B}(\text{OH})_4^-$	$1.6 \times 10^6$	9.8	p.r.	D.k. in soln. contg. acrylamide; cor. to $I = 0$ .	75A052 74A182
367.134	$[\text{CH}_2\text{CHCO}_2\text{H}]^- + \text{B}(\text{OH})_3 \rightarrow \text{CH}_3\dot{\text{C}}\text{HCO}_2^- + \text{B}(\text{OH})_3$	$2.8 \times 10^5$	>7	p.r.	Calcd. from effect of borate on d.k. in acrylate soln.	76A113
368.	<b>Phosphate ion</b>					
368.114	$\cdot\text{CHOHCONH}_2 + \text{HPO}_4^{2-} \rightleftharpoons \cdot\text{CHO}^-\text{CONH}_2 + \text{H}_2\text{PO}_4^-$	$k_t = 1.8 \times 10^9$	8.3	p.r.	Calcd. from effects of $[\text{HPO}_4^{2-}]$ on d.k. at 290 nm in $\text{N}_2\text{O}$ -satd. glycolamide soln.; cor. to $I = 0$ .	75A053
368.116	$\cdot\text{COH}(\text{CH}_3)\text{CONH}_2 + \text{HPO}_4^{2-} \rightleftharpoons \cdot\text{CO}^-(\text{CH}_3)\text{CONH}_2 + \text{H}_2\text{PO}_4^-$	$k_t = 8.5 \times 10^8$	6.2	p.r.	Calcd. from effect of $[\text{HPO}_4^{2-}]$ on d.k. at 300 nm in $\text{N}_2\text{O}$ -satd. lactamide soln.; cor. to $I = 0$ .	75A053
368.128	$[\text{CH}_2\text{CHCONH}_2]^- + \text{H}_2\text{PO}_4^- \rightarrow \text{CH}_3\dot{\text{C}}\text{HCONH}_2 + \text{HPO}_4^{2-}$	$3.8 \times 10^6$		p.r.	D.k. in soln. contg. acrylamide; cor. to $I = 0$ .	75A052 74A182
	$[\text{CH}_2\text{CHCONH}_2]^- + \text{HPO}_4^{2-} \rightarrow \text{CH}_3\dot{\text{C}}\text{HCONH}_2 + \text{PO}_4^{3-}$	$8.6 \times 10^4$		p.r.	D.k. in soln. contg. acrylamide; cor. to $I = 0$ .	75A052 74A182
368.133	$[(\text{CH}_3)_2\text{NCONNCON}(\text{CH}_3)_2]^- + \text{H}_2\text{PO}_4^{2-} \rightarrow (\text{CH}_3)_2\text{NCONHNCON}(\text{CH}_3)_2 + \text{HPO}_4^{2-}$	$(7 \pm 1) \times 10^7$	6-9	p.r.	Effect of $[\text{H}_2\text{PO}_4^-]$ on d.k. at 300 nm in soln. contg. $10^{-4}$ mol L <sup>-1</sup> Diamide and 0.2 mol L <sup>-1</sup> <i>tert</i> -BuOH.	75A194
368.134	$[\text{CH}_2\text{CHCOOH}]^- + \text{HPO}_4^{2-} \rightarrow \text{CH}_3\dot{\text{C}}\text{HCO}_2^- + \text{HPO}_4^{2-}$	$7 \times 10^3$	>7	p.r.	Calcd. from effect of $[\text{HPO}_4^{2-}]$ on d.k. in acrylate soln.; cor. to $I = 0$ .	76A113
	$[\text{CH}_2\text{CHCOOH}]^- + \text{H}_2\text{PO}_4^- \rightarrow \text{CH}_3\dot{\text{C}}\text{HCO}_2^- + \text{H}_2\text{PO}_4^-$	$5.7 \times 10^6$	>7	p.r.	Calcd. from effect of $[\text{H}_2\text{PO}_4^-]$ on d.k. in acrylate soln.; cor. to $I = 0$ .	76A113
369.	<b>Pyrophosphate ion</b>					
369.114	$\cdot\text{CHOHCONH}_2 + \text{HP}_2\text{O}_7^{3-} \rightarrow \cdot\text{CHO}^-\text{CONH}_2 + \text{H}_2\text{P}_2\text{O}_7^{2-}$	$1.1 \times 10^9$	6.10, 6.40	p.r.	Calcd. from effect of $[\text{HP}_2\text{O}_7^{3-}]$ on d.k. at 290 nm in $\text{N}_2\text{O}$ -satd. glycolamide soln.; cor. to $I = 0$ .	75A053
369.115	$\cdot\text{CHOHCOO}^- + \text{P}_2\text{O}_7^{4-} \rightarrow \cdot\text{CHO}^-\text{COO}^- + \text{HP}_2\text{O}_7^{3-}$	$5.8 \times 10^6$	9.26, 9.75	p.r.	Calcd. from effect of $[\text{P}_2\text{O}_7^{4-}]$ on d.k. at 270 nm in $\text{N}_2\text{O}$ -satd. glycolate soln.; cor. to $I = 0$ .	75A053
369.116	$\cdot\text{COH}(\text{CH}_3)\text{CONH}_2 + \text{HP}_2\text{O}_7^{3-} \rightarrow \cdot\text{CO}^-(\text{CH}_3)\text{CONH}_2 + \text{H}_2\text{P}_2\text{O}_7^{2-}$	$3.7 \times 10^8$	8.1, 9.3	p.r.	Calcd. from effect of $[\text{HP}_2\text{O}_7^{3-}]$ on d.k. at 300 nm in $\text{N}_2\text{O}$ -satd. soln. contg. lactamide; $k = 8.5 \times 10^8$ for $\text{P}_2\text{O}_7^{4-}$ .	75A053
369.134	$[\text{CH}_2\text{CHCOOH}]^- + \text{HP}_2\text{O}_7^{3-} \rightarrow \text{CH}_3\dot{\text{C}}\text{HCO}_2^- + \text{HP}_2\text{O}_7^{3-}$	$9.1 \times 10^4$	>7	p.r.	Calcd. from effect of $[\text{HP}_2\text{O}_7^{3-}]$ on d.k. in acrylate soln.; cor. to $I = 0$ .	76A113

TABLE 3. Rate constants for acid- and base-catalyzed proton transfer reactions of aliphatic radicals in aqueous solution—Continued

No.	Reaction	$k$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
370.	<b>Bicarbonate ion</b>					
370.128	$[\text{CH}_2\dot{\text{C}}\text{HCONH}_2]^- + \text{HCO}_3^- \rightarrow$ $\text{CH}_3\dot{\text{C}}\text{HCONH}_2 + \text{CO}_3^{2-}$	$8.6 \times 10^5$		p.r.	D.k. in soln. contg. acrylamide; cor. to $I = 0$ .	75A052 74A182
371.	<b>Trimethylammonium ion</b>					
371.128	$[\text{CH}_2\dot{\text{C}}\text{HCONH}_2]^- + (\text{CH}_3)_3\text{NH}^+ \rightarrow$ $\text{CH}_3\dot{\text{C}}\text{HCONH}_2 + (\text{CH}_3)_3\text{N}$	$2.1 \times 10^9$		p.r.	D.k. in soln. contg. acrylamide; cor. to $I = 0$ .	75A052 74A182
372.	<b>Ethylammonium ion</b>					
372.128	$[\text{CH}_2\dot{\text{C}}\text{HCONH}_2]^- + \text{C}_2\text{H}_5\text{NH}_3^+ \rightarrow$ $\text{CH}_3\dot{\text{C}}\text{HCONH}_2 + \text{C}_2\text{H}_5\text{NH}_2$	$1.5 \times 10^7$		p.r.	D.k. in soln. contg. acrylamide.	75A052 74A182
373.	<b>Diethylammonium ion</b>					
373.128	$[\text{CH}_2\dot{\text{C}}\text{HCONH}_2]^- + (\text{C}_2\text{H}_5)_2\text{NH}_2^+ \rightarrow$ $\text{CH}_3\dot{\text{C}}\text{HCONH}_2 + (\text{C}_2\text{H}_5)_2\text{NH}$	$7.2 \times 10^7$		p.r.	D.k. in soln. contg. acrylamide.	75A052 74A182
374.	<b>Triethylammonium ion</b>					
374.128	$[\text{CH}_2\dot{\text{C}}\text{HCONH}_2]^- + (\text{C}_2\text{H}_5)_3\text{NH}^+ \rightarrow$ $\text{CH}_3\dot{\text{C}}\text{HCONH}_2 + (\text{C}_2\text{H}_5)_3\text{N}$	$1.3 \times 10^8$	10.3– 11.8	p.r.	D.k. in soln. contg. acrylamide; cor. to $I = 0$ .	75A052 74A182
375.	<b>Cyclohexylammonium ion</b>					
375.128	$[\text{CH}_2\dot{\text{C}}\text{HCONH}_2]^- + c\text{-C}_6\text{H}_{11}\text{NH}_3^+ \rightarrow$ $\text{CH}_3\dot{\text{C}}\text{HCONH}_2 + c\text{-C}_6\text{H}_{11}\text{NH}_2$	$1.4 \times 10^7$		p.r.	D.k. in soln. contg. acrylamide.	75A052 74A182
376.	<b>Pyrrolidinium ion</b>					
376.128	$[\text{CH}_2\dot{\text{C}}\text{HCONH}_2]^- + c\text{-C}_4\text{H}_8\text{NH}_2^+ \rightarrow$ $\text{CH}_3\dot{\text{C}}\text{HCONH}_2 + c\text{-C}_4\text{H}_8\text{NH}$	$2.0 \times 10^8$		p.r.	D.k. in soln. contg. acrylamide.	75A052 74A182
377.	<b>Piperidinium ion</b>					
377.128	$[\text{CH}_2\dot{\text{C}}\text{HCONH}_2]^- + c\text{-C}_5\text{H}_{10}\text{NH}_2^+ \rightarrow$ $\text{CH}_3\dot{\text{C}}\text{HCONH}_2 + c\text{-C}_5\text{H}_{10}\text{NH}$	$6.3 \times 10^7$		p.r.	D.k. in soln. contg. acrylamide.	75A052 74A182
378.	<b>Glycine</b>					
378.128	$[\text{CH}_2\dot{\text{C}}\text{HCONH}_2]^- + \text{H}_3\text{N}^+\text{CH}_2\text{CO}_2^- \rightarrow$ $\text{CH}_3\dot{\text{C}}\text{HCONH}_2 + \text{H}_2\text{NCH}_2\text{CO}_2^-$	$2.5 \times 10^7$		p.r.	D.k. in soln. contg. acrylamide.	75A052 74A182

TABLE 4. Rate constants for second order decay of selected aliphatic radicals in aqueous solution—Continued

No.	Reaction	$k^a$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
.001	<b>Methyl</b> ·CH <sub>3</sub> + ·CH <sub>3</sub> → C <sub>2</sub> H <sub>6</sub>	(1.24 ± 0.2) × 10 <sup>9</sup>	5.5	p.r.	D.k. in soln. contg. 10 <sup>-2</sup> mol L <sup>-1</sup> CH <sub>4</sub> and 0.25 mol L <sup>-1</sup> N <sub>2</sub> O; ε = 850 L mol <sup>-1</sup> cm <sup>-1</sup> at 220 nm.	72G445
		(1.6 ± 0.2) × 10 <sup>9</sup>	4.4	p.r.	D.k. in soln. contg. 0.4 mol L <sup>-1</sup> CH <sub>4</sub> (30 atm) and 2.5 × 10 <sup>-3</sup> mol L <sup>-1</sup> N <sub>2</sub> O; ε = 1600 and 975 L mol <sup>-1</sup> cm <sup>-1</sup> at 213 and 220 nm., resp.; E <sub>a</sub> = 3.9 ± 0.4 kcal mol <sup>-1</sup> (16 kJ mol <sup>-1</sup> ).	75A055
.002	<b>Ethyl</b> ·CH <sub>2</sub> CH <sub>3</sub> + ·CH <sub>2</sub> CH <sub>3</sub>	(9.6 ± 2) × 10 <sup>8</sup>	5.5	p.r.	D.k. in soln. contg. 10 <sup>-2</sup> mol L <sup>-1</sup> ethane and 0.25 mol L <sup>-1</sup> N <sub>2</sub> O; ε = 520 and 330 L mol <sup>-1</sup> cm <sup>-1</sup> at 220 and 250 nm, resp.	72G445
		(1.2 ± 0.2) × 10 <sup>9</sup>	4.4	p.r.	D.k. in soln. contg. 5 × 10 <sup>-2</sup> mol L <sup>-1</sup> ethane (30 atm) and 2.5 × 10 <sup>-3</sup> mol L <sup>-1</sup> N <sub>2</sub> O; ε = 790, 750, 700, 545 and 375 L mol <sup>-1</sup> cm <sup>-1</sup> at 210, 215, 220, 230 and 250 nm, resp.; E <sub>a</sub> = 3.9 ± 0.4 kcal mol <sup>-1</sup> (16 kJ mol <sup>-1</sup> ).	75A055
.004	<b>Cyclopentyl</b> c-Ĉ <sub>5</sub> H <sub>9</sub> + c-Ĉ <sub>5</sub> H <sub>9</sub> → C <sub>10</sub> H <sub>18</sub> and C <sub>5</sub> H <sub>10</sub> + C <sub>5</sub> H <sub>8</sub>	(1.0 ± 0.2) × 10 <sup>9</sup>	7	p.r.	D.k. in soln. contg. N <sub>2</sub> O and 1.3 × 10 <sup>-5</sup> mol L <sup>-1</sup> cyclopentane; ε = 480 L mol <sup>-1</sup> cm <sup>-1</sup> at 248 nm.	74A051
.016	<b>2-Hydroxy-2,2-dimethylethyl</b> ·CH <sub>2</sub> C(CH <sub>3</sub> ) <sub>2</sub> OH + ·CH <sub>2</sub> C(CH <sub>3</sub> ) <sub>2</sub> OH	7 × 10 <sup>8</sup>	6	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. <i>tert</i> -BuOH; ε = 900, 200 and 30 L mol <sup>-1</sup> cm <sup>-1</sup> at 225, 250 and 280 nm, resp. 2k/ε = 1.3 × 10 <sup>7</sup> and 1.1 × 10 <sup>7</sup> at pH 6 and 13.5, resp.	69G419
		6 × 10 <sup>8</sup>	13.5			
.020	<b>Formylmethyl</b> ·CH <sub>2</sub> CHO + ·CH <sub>2</sub> CHO	4.5 × 10 <sup>8</sup>	10	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. 0.1 mol L <sup>-1</sup> ethylene glycol; ε = 260 L mol <sup>-1</sup> cm <sup>-1</sup> at 300 nm.	73G004
		4.5 × 10 <sup>8</sup>	9.8	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. 10 <sup>-3</sup> mol L <sup>-1</sup> acetylene; 2k/ε = 3.4 × 10 <sup>6</sup> cm s <sup>-1</sup> .	78A007
.021	<b>2-Hydroxyethenyl</b> ·CH=CHOH + ·CH=CHOH → HOCH=CHCH=CHOH	3.2 × 10 <sup>9</sup>	<7	p.r.	P.b.k. in N <sub>2</sub> O-satd. soln. contg. 10 <sup>-3</sup> mol L <sup>-1</sup> acetylene at 240 nm (ε = 8.1 × 10 <sup>3</sup> L mol <sup>-1</sup> cm <sup>-1</sup> ); 2k/ε = 2.0 × 10 <sup>5</sup> cm s <sup>-1</sup> ; prod. rearranges to succinaldehyde.	78A007
.035	<b>Carboxymethyl</b> ·CH <sub>2</sub> CO <sub>2</sub> <sup>-</sup> + ·CH <sub>2</sub> CO <sub>2</sub> <sup>-</sup>	(5.5 ± 1) × 10 <sup>8</sup>	6.5	p.r.	D.k. at 366 nm in N <sub>2</sub> O-satd. soln. contg. Na acetate; ε = 780 L mol <sup>-1</sup> cm <sup>-1</sup> .	76A082
		5 × 10 <sup>8</sup>	10	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. acetate ion; ε = 800 L mol <sup>-1</sup> cm <sup>-1</sup> at 350 nm.	69G446
		9 × 10 <sup>8</sup>	3	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. acetic acid; ε = 650 L mol <sup>-1</sup> cm <sup>-1</sup> at 320 nm; pK <sub>a</sub> = 4.5.	69G446
.048	<b>Trichloromethyl</b> ·CCl <sub>3</sub> + ·CCl <sub>3</sub> → C <sub>2</sub> Cl <sub>6</sub>	(3.7 ± 0.9) × 10 <sup>8</sup>	5.5–12.4	p.r.	D.k. at 230 nm in 10 <sup>-4</sup> mol L <sup>-1</sup> CCl <sub>4</sub> soln.; ε = 2300 ± 450 L mol <sup>-1</sup> cm <sup>-1</sup> .	74A043



TABLE 4. Rate constants for second order decay of selected aliphatic radicals in aqueous solution—Continued

No.	Reaction	$k^a$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.
.075	<b>Hydroxymethyl</b> ·CH <sub>2</sub> OH + ·CH <sub>2</sub> OH	1.2 x 10 <sup>9</sup>	6	p.r.	D.k. at 280 and 350 nm, resp., at pH 6 and 12 in N <sub>2</sub> O-satd. soln. contg. MeOH; $2k/\epsilon = 6.2 \times 10^6$ and $1.5 \times 10^6$ at pH 6 and 12, resp. ( $\epsilon = 390$ and $600$ ); $pK_a = 10.7$ [66G074].	69G419
	·CH <sub>2</sub> O <sup>-</sup> + ·CH <sub>2</sub> O <sup>-</sup>	4.5 x 10 <sup>8</sup>	12			
	·CH <sub>2</sub> OH + ·CH <sub>2</sub> OH	(1.5 ± 1) x 10 <sup>9</sup>		p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. MeOH; $\epsilon = 270 \pm 15$ L mol <sup>-1</sup> cm <sup>-1</sup> at 310 nm.	77A011
.076	<b>1-Hydroxyethyl</b> CH <sub>3</sub> ·CHOH + CH <sub>3</sub> ·CHOH → CH <sub>3</sub> CHOHCHOHCH <sub>3</sub> (I)	(5.5 ± 1.5) x 10 <sup>8</sup> $k_I = (4.4 \pm 1) \times 10^8$	~7	p.r.	D.k. at 289.4 nm in deaerated soln. contg. EtOH; $\epsilon = 260 \pm 65$ L mol <sup>-1</sup> cm <sup>-1</sup> ; relative disproportionation and combination est. from product yields.	62G140
	→ CH <sub>3</sub> CHO + CH <sub>3</sub> CH <sub>2</sub> OH (II)	$k_{II} = (1.1 \pm 0.3) \times 10^8$ (7 ± 2) x 10 <sup>8</sup>	~1	p.r.	D.k. at 296.7 nm in deaerated soln. contg. EtOH and 0.8 N H <sub>2</sub> SO <sub>4</sub> ; $\epsilon = 240 \pm 45$ L mol <sup>-1</sup> cm <sup>-1</sup> .	63G045
		(1.2 ± 0.3) x 10 <sup>9</sup>	6	p.r.	D.k. at 280 and 300 nm, resp., at pH 6 and 13 in N <sub>2</sub> O-satd. soln. contg. EtOH; $pK_a = 11.6$ [66G074]; $2k/\epsilon = 4.7 \times 10^6$ and $5.7 \times 10^6$ resp., at pH 6 and 13.	69G419
	CH <sub>3</sub> ·CHO <sup>-</sup> + CH <sub>3</sub> ·CHO <sup>-</sup>	(2.5 ± 0.5) x 10 <sup>8</sup>	13			
.078	<b>1-Hydroxy-1-methylethyl</b> (CH <sub>3</sub> ) <sub>2</sub> ·CHOH + (CH <sub>3</sub> ) <sub>2</sub> ·CHOH (CH <sub>3</sub> ) <sub>2</sub> ·C·O <sup>-</sup> + (CH <sub>3</sub> ) <sub>2</sub> ·C·O <sup>-</sup>	(7 ± 1.5) x 10 <sup>8</sup> (2 ± 0.4) x 10 <sup>8</sup>	6 13.3	p.r.	D.k. at 280 and 300 nm, resp. at pH 6 and 13.3 in N <sub>2</sub> O-satd. soln. contg. 2-PrOH; $2k/\epsilon = 2.1 \times 10^6$ and $2.7 \times 10^5$ at pH 6 and 13.3, resp.; $pK_a = 12.2$ [66G074].	69G419
		(6.5 ± 0.5) x 10 <sup>8</sup>		p.r.	D.k. at 310 nm in N <sub>2</sub> O-satd. soln. contg. 0.02 mol L <sup>-1</sup> 2-PrOH; $\epsilon = 353 \pm 15$ L mol <sup>-1</sup> cm <sup>-1</sup> .	77A011
.101	<b>1,2-Dihydroxyethyl</b> ·CHOHCH <sub>2</sub> OH + ·CHOHCH <sub>2</sub> OH	3.4 x 10 <sup>8</sup>	6.0	p.r.	D.k. at 250 nm in N <sub>2</sub> O-satd. soln. contg. ethylene glycol; $2k/\epsilon = 1.1 \times 10^6$ ( $\epsilon = 610$ L mol <sup>-1</sup> cm <sup>-1</sup> ).	73G004
.113	<b>Ascorbate radical</b> ·A <sup>-</sup> + ·A <sup>-</sup> (+ H <sup>+</sup> ) → A + HA <sup>-</sup>	(1.9 ± 0.2) x 10 <sup>5</sup>	8.7	p.r.	D.k. at 360 nm in N <sub>2</sub> O-satd. soln. contg. ascorbate; $\epsilon = 3300$ L mol <sup>-1</sup> cm <sup>-1</sup> [77A036]; $pK_a = -0.45$ [72D181].	75A240
.115	<b>(Carboxy)hydroxymethyl</b> ·CHOHCO <sub>2</sub> H + ·CHOHCO <sub>2</sub> H ·CHOHCO <sub>2</sub> <sup>-</sup> + ·CHOHCO <sub>2</sub> <sup>-</sup> ·CHO <sup>-</sup> CO <sub>2</sub> <sup>-</sup> + ·CHO <sup>-</sup> CO <sub>2</sub> <sup>-</sup>	(6.5 ± 1) x 10 <sup>8</sup> (4.3 ± 0.7) x 10 <sup>8</sup> (7.5 ± 1) x 10 <sup>6</sup>	1 7.2 12	p.r.	D.k. in N <sub>2</sub> O-satd. soln. contg. 0.05 mol L <sup>-1</sup> glycolic acid ( $\epsilon = 6000$ L mol <sup>-1</sup> cm <sup>-1</sup> ); $pK_a = 4.6, 9.8$ .	69G447
.123	<b>Dihydroxymethyl</b> ·CH(OH) <sub>2</sub> + ·CH(OH) <sub>2</sub> → CH <sub>2</sub> (OH) <sub>2</sub> + HCO <sub>2</sub> <sup>-</sup> + H <sup>+</sup>	3.6 x 10 <sup>8</sup> 2.3 x 10 <sup>8</sup>	6.3 12	p.r.	D.k. at 250 nm, as well as condy. change, in N <sub>2</sub> O-satd. soln. contg. formaldehyde, as well as in soln. contg. <i>tert</i> -BuOH and CO; $\epsilon \approx 850$ and $1500$ L mol <sup>-1</sup> cm <sup>-1</sup> at pH 6 and 11.8, resp.; $pK_a = 9.5$ .	71G424

TABLE 4. Rate constants for second order decay of selected aliphatic radicals in aqueous solution—Continued

No.	Reaction	$k^a$ (L mol <sup>-1</sup> s <sup>-1</sup> )	pH	Method	Comment	Ref.	
.147	<b>Carboxyl</b> $\cdot\text{CO}_2^- + \cdot\text{CO}_2^- \rightarrow \text{C}_2\text{O}_4^{2-}$	$5 \times 10^8$	5	p.r.	D.k. at 250 nm in CO <sub>2</sub> -satd. soln. contg. 10 <sup>-2</sup> mol L <sup>-1</sup> formate; $\epsilon = 2250$ L mol <sup>-1</sup> cm <sup>-1</sup> ; $k$ cor. to $I = 0$ .	65G384	
		$7.5 \times 10^8$	3.1,9	p.r.	D.k. at 255 nm in N <sub>2</sub> O-satd. soln. contg. formate, as well as in CO <sub>2</sub> -satd. soln. contg. formate; $\epsilon_{\text{max}} = 3000$ L mol <sup>-1</sup> cm <sup>-1</sup> at 235 nm.	69G446	
		$8.5 \times 10^8$	13				
		$(4.5 \pm 0.15) \times 10^8$	2.8-7	p.r.	D.k. in CO-satd. soln. at 260 nm ( $\epsilon = 2200$ L mol <sup>-1</sup> cm <sup>-1</sup> ) as well as condy. change; same result in N <sub>2</sub> O-satd. formate soln.	70G303	
		$(3.8 \pm 0.35) \times 10^8$	2.7	p.r.	D.k. at 250 nm in N <sub>2</sub> O-satd. 0.1 mol L <sup>-1</sup> formate soln.; $\epsilon = 2050$ L mol <sup>-1</sup> cm <sup>-1</sup> (1100 at pH 0); $k$ cor. to $I = 0$ ; $\text{p}K_a(\cdot\text{CO}_2\text{H}) = 1.4$ .	73G085	
		$(8.5 \pm 1) \times 10^8$	13				
		0					

<sup>a</sup>  $k$  is defined by the expression  $-d[\text{R}]/dt = 2k[\text{R}]^2$ .

## Index to Radical Reactions

Radicals are listed in number order. Following the name of the radical are the entry numbers for the substrates for which reactions of that radical are included in tables 1-3. For example, the first reaction in the tables for methyl radical is under entry 9 and the reaction is numbered 9.001.

- 001 Methyl 9, 10, 20, 59, 69, 80, 81a, 83, 93, 94, 115, 116, 117, 147, 149, 156, 160, 200, 201, 202, 217, 219, 221a, 222, 223, 230, 241, 242, 243, 248, 254, 255, 267, 305, 314, 315, 316, 317, 345, 346.
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- 004 Cyclopentyl 88, 93, 94, 342, 343, 345, 346.
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- 008 Radicals from linoleate + OH 93.
- 009 Radicals from linolenate + OH 93.
- 010 Radicals from arachidonate + OH 93.
- 011 2-Aminoethyl 262.
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- 017 2-Carboxy-2-hydroxy-2-methylethyl 71, 104.
- 018 Radicals from allyl alcohol + OH 161, 278, 279, 283.
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- 026 1-Formyl-2-hydroxyethyl 227.
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- 031 Radicals from xylitol 227.
- 032 2-Oxo-3,4,5-trihydroxycyclohexyl 227.
- 033 Radicals from sorbitol 161, 227.
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- 040 1-Carboxy-2-hydroxypropyl 278.
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- 042 Dicarboxymethyl 12, 55, 100, 110, 135, 228, 278.
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- 044 Difluoromethyl
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- 047 Trifluoromethyl 130, 147, 149, 200, 202, 212, 214, 255, 292, 313, 314, 317.
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- 065 Radicals from diglycine + OH 262.
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- 067 Radicals from acetyldiglycine + OH 93, 262.
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- 069 Radicals from acetyl triglycine + OH 262.
- 070 Radicals from acetyltrialanine + OH 262.
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- 094a (Methoxymethoxy)methyl 347.
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- 103 1,2-Dihydroxy-1-methylpropyl 347.

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- 106 1,2,3-Trihydroxypropyl 5, 69, 93, 163, 225, 278, 347.
- 107 1-Hydroxy-1-methyl-2-oxopropyl 12, 100.
- 108 Radicals from deoxyribose + OH 69, 93, 138, 262, 278, 279, 342.
- 109 Radicals from ribose + OH 206, 227, 262, 278.
- 110 Radicals from ribose phosphate + OH 262, 278.
- 111 Radicals from glucose + OH 69, 93, 158, 161, 194, 195, 227, 279, 287, 342, 343, 345, 346, 347, 355.
- 112 Radicals from sucrose + OH 347.
- 113 Radical from ascorbate + OH 59, 93, 163, 179, 214, 246, 247, 255, 262, 330.
- 114 (Carbamoyl)hydroxymethyl 262, 362, 365, 366, 368, 369.
- 115 (Carboxy)hydroxymethyl 55, 69, 81a, 93, 133, 138, 228, 262, 274, 333, 362, 365, 366, 368, 369.
- 116 1-Carbamoyl-1-hydroxyethyl 138, 362, 365, 366, 368, 369.
- 117 1-Carboxy-1-hydroxyethyl 12, 55, 69, 93, 100, 134, 138, 148, 163, 225, 262, 278, 283.
- 118 1-Hydroxy-1-(methoxycarbonyl)ethyl 262.
- 119 (Dicarboxy)hydroxymethyl 262.
- 120 1,2-Dicarboxy-1-hydroxyethyl 163, 262, 278.
- 121 1,2-Dicarboxy-1,2-dihydroxyethyl 163, 165, 225, 262, 270.
- 122 1,3-Dicarboxy-1-hydroxypropyl 262.
- 123 Dihydroxymethyl 93, 283.
- 124 Dimethoxymethyl 94, 347.
- 125 2,5-Dioxacyclopentyl 94.
- 126 2,2,2-Trichloro-1,1-dihydroxyethyl 93.
- 127 Carbamoyl 12, 55, 100.
- 128 Electron adduct of acrylamide 1, 123, 363, 364, 367, 368, 370, 371, 373, 374, 375, 376, 377, 378.
- 129 Electron adduct of crotonamide 363.
- 130 Electron adduct of methacrylamide 363.
- 131 Electron adduct of  $\beta,\beta$ -dimethylacrylamide 363.
- 132 Electron adduct of *N,N*-dimethylacrylamide 363.
- 133 Electron adduct of Diamide 368.
- 134 Electron adduct of acrylate 362, 364, 365, 366, 367, 368, 369.
- 135 Electron adduct of crotonate 362, 363.
- 136 Electron adduct of methacrylate 362, 363.
- 137 Electron adduct of  $\beta,\beta$ -dimethylacrylate 362, 363.
- 138 Electron adduct of methyl methacrylate 363.
- 139 Electron adduct of sorbate 362, 363.
- 141 Electron adduct of dimethyl fumarate 93, 206.
- 142 Electron adduct of glycine anhydride 118, 137, 160a, 162, 163, 215a, 216, 253a, 262.
- 143 Electron adduct of alanine anhydride 118, 137, 160a, 162, 262.
- 144 Electron adduct of sarcosine anhydride 118, 137, 162, 262.
- 146 Electron adduct of acetylglycylglycinamide 262.
- 147 Carboxyl 1, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 16, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 30, 31, 32, 44, 46, 49, 50, 53, 54, 55, 56, 59, 60, 61, 62, 63, 64, 65, 66, 69, 70, 74, 76, 78, 81a, 82, 88, 89, 90, 91, 92, 93, 94, 98, 99, 100, 103, 107, 108, 109, 110, 111, 112, 113, 114, 118, 121, 122, 123, 125, 126, 132, 133, 134, 138, 143, 144, 146, 150, 151, 152, 158, 159, 163, 164, 165, 167, 168, 169, 170, 171, 172, 173, 175, 183, 184, 185a, 190, 191, 192, 193, 195, 196, 199, 203, 206, 208, 209, 213, 214, 216, 218, 220, 225, 228, 231, 233, 233a, 240, 249, 251, 252, 256, 260, 262, 270, 271, 276, 278, 279, 283, 284, 285, 286, 287a, 297, 319, 320, 321, 323, 324, 329, 332, 333, 341, 342, 347, 354, 356.
- 148 Electron adduct of methyl acetate 361.

## Radical Formula Index

The radical numbers following the name are contained in the *List of Aliphatic Radicals* preceding table I and in the *Index to Radicals* just preceding this index.

CCl <sub>2</sub> F	Dichlorofluoromethyl, 046	C <sub>3</sub> H <sub>8</sub> N	1-Amino-1-methylethyl, 050
CCl <sub>3</sub>	Trichloromethyl, 048	C <sub>4</sub> H <sub>4</sub> O <sub>4</sub> <sup>-</sup>	Electron adduct of maleate, 140
CF <sub>3</sub>	Trifluoromethyl, 047	C <sub>4</sub> H <sub>5</sub> N <sub>2</sub> O <sub>2</sub>	Radical from glycine anhydride + OH, 062
CHCl <sub>2</sub>	Dichloromethyl, 045	C <sub>4</sub> H <sub>5</sub> O <sub>4</sub>	1,2-Dicarboxyethyl, 040a
CHF <sub>2</sub>	Difluoromethyl, 044	C <sub>4</sub> H <sub>5</sub> O <sub>5</sub>	1,2-Dicarboxy-1-hydroxyethyl, 120
CH <sub>2</sub> Cl	Chloromethyl, 043		1,2-Dicarboxy-2-hydroxyethyl, 041
CH <sub>2</sub> NO	Carbamoyl, 127	C <sub>4</sub> H <sub>5</sub> O <sub>6</sub>	1,2-Dicarboxy-1,2-dihydroxyethyl, 121
CH <sub>3</sub>	Methyl, 001	C <sub>4</sub> H <sub>6</sub> NO <sub>3</sub>	<i>N</i> -Acetylamino(carboxy)methyl, 060
CH <sub>3</sub> O	Hydroxymethyl, 075	C <sub>4</sub> H <sub>6</sub> O <sub>2</sub> <sup>-</sup>	Electron adduct of crotonate, 135
CH <sub>3</sub> O <sub>2</sub>	Dihydroxymethyl, 123		Electron adduct of methacrylate, 136
CO <sub>2</sub> <sup>-</sup>	Carboxyl, 147	C <sub>4</sub> H <sub>7</sub> NO <sup>-</sup>	Electron adduct of crotonamide, 129
C <sub>2</sub> H <sub>2</sub> Cl <sub>3</sub> O <sub>2</sub>	2,2,2-Trichloro-1,1-dihydroxyethyl, 126		Electron adduct of methacrylamide, 130
C <sub>2</sub> H <sub>2</sub> F <sub>3</sub> O	2,2,2-Trifluoro-1-hydroxyethyl, 089	C <sub>4</sub> H <sub>7</sub> N <sub>2</sub> O <sub>2</sub> <sup>-</sup>	Electron adduct of glycine anhydride, 142
C <sub>2</sub> H <sub>3</sub> O	Formylmethyl, 020		Radicals from glycyglycinamide + OH, 058
	2-Hydroxyethenyl, 022	C <sub>4</sub> H <sub>7</sub> N <sub>2</sub> O <sub>3</sub>	Radicals from diglycine + OH, 065
C <sub>2</sub> H <sub>3</sub> O <sub>2</sub>	Carboxymethyl, 035	C <sub>4</sub> H <sub>7</sub> O	1-Acetyethyl, 024
C <sub>2</sub> H <sub>3</sub> O <sub>3</sub>	(Carboxy)hydroxymethyl, 115		1-Hydroxycyclobutyl, 084
C <sub>2</sub> H <sub>4</sub> Cl	2-Chloroethyl, 005	C <sub>4</sub> H <sub>7</sub> O <sub>2</sub>	Radicals from crotyl alcohol + OH, 019
C <sub>2</sub> H <sub>4</sub> NO	Carbamoylmethyl, 034		2-Tetrahydrofuryl, 094
C <sub>2</sub> H <sub>4</sub> NO <sub>2</sub>	Amino(carboxy)methyl, 056		1-Carboxypropyl, 038
	(Carbamoyl)hydroxymethyl, 114		2,5-Dioxacyclohexyl, 104
C <sub>2</sub> H <sub>4</sub> O <sub>4</sub> S <sup>-</sup>	1-Sulfatoethyl, 091		1-Hydroxy-1-methyl-2-oxopropyl, 107
C <sub>2</sub> H <sub>5</sub>	Ethyl, 002	C <sub>4</sub> H <sub>7</sub> O <sub>3</sub>	4-Hydroxy-2-oxobutyl, 027
C <sub>2</sub> H <sub>5</sub> N <sub>2</sub> O	Amino(carbamoyl)methyl, 057		2-Carboxy-1-hydroxy-1-methylethyl, 097
C <sub>2</sub> H <sub>5</sub> O	1-Hydroxyethyl, 076		2-Carboxy-2-hydroxy-2-methylethyl, 017
	2-Hydroxyethyl, 014		1-Carboxy-2-hydroxypropyl, 040
	Methoxymethyl, 092a		1-Hydroxy-1-(methoxycarbonyl)ethyl, 118
C <sub>2</sub> H <sub>5</sub> O <sub>2</sub>	1,2-Dihydroxyethyl, 101		Radicals from <i>meso</i> -erythritol, 030
C <sub>2</sub> H <sub>6</sub> N	1-Aminoethyl, 049		( <i>N</i> -Acetyl- <i>N</i> -methylamino)methyl, 055
	2-Aminoethyl, 011		2-Amino-2-carboxy-2-methylethyl, 013
C <sub>2</sub> H <sub>6</sub> NO	2-Amino-1-hydroxyethyl, 098		1,1-Dimethylethyl, 002b
C <sub>2</sub> H <sub>7</sub> NO <sub>4</sub> P	2-Amino-1-phosphoryloxyethyl, 099		1-Ethoxyethyl, 093
C <sub>3</sub> H <sub>3</sub> O <sub>4</sub>	Dicarboxymethyl, 042		1-Hydroxybutyl, 079
C <sub>3</sub> H <sub>3</sub> O <sub>5</sub>	(Dicarboxy)hydroxymethyl, 119		2-Hydroxy-2,2-dimethylethyl, 016
C <sub>3</sub> H <sub>4</sub> O <sub>2</sub> <sup>-</sup>	Electron adduct of acrylate, 134		1-Hydroxy-1-methylpropyl, 080
C <sub>3</sub> H <sub>5</sub> NO <sup>-</sup>	Electron adduct of acrylamide, 128		1-Hydroxy-2-methylpropyl, 081
C <sub>3</sub> H <sub>5</sub> O	1-Formylethyl, 021		1,4-Dihydroxybutyl, 095
	2-Oxopropyl, 023		1,2-Dihydroxy-1-methylpropyl, 103
	Radicals from allyl alcohol + OH, 018		Radicals from crotyl alcohol + OH, 019
C <sub>3</sub> H <sub>5</sub> O <sub>2</sub>	Acetoxymethyl, 090		2-Amino-2,2-dimethylethyl, 012
	1-Carboxyethyl, 037		Radical from 2-pyrrolidone-5-carboxylic acid, 074
	2,5-Dioxacyclopentyl, 125		2-Oxocyclopentyl, 032
	1-Formyl-2-hydroxyethyl, 026		1,3-Dicarboxy-1-hydroxypropyl, 122
	Methoxycarbonylmethyl, 036		<i>N</i> -Acetyl- <i>N</i> -methylamino(carboxy)methyl, 061
C <sub>3</sub> H <sub>5</sub> O <sub>3</sub>	1-Carboxy-1-hydroxyethyl, 117		Electron adduct of β,β-dimethylacrylate, 137
	1-Carboxy-2-hydroxyethyl, 039		Electron adduct of methyl methacrylate, 138
C <sub>3</sub> H <sub>6</sub> NO	( <i>N</i> -Acetylamino)methyl, 053		Cyclopentyl, 004
	( <i>N</i> -Formyl- <i>N</i> -methylamino)methyl, 054		Electron adduct of <i>N,N</i> -dimethylacrylamide, 132
C <sub>3</sub> H <sub>6</sub> NO <sub>2</sub>	1-Carbamoyl-1-hydroxyethyl, 116		Electron adduct of β,β-dimethylacrylamide, 131
	Carboxy( <i>N</i> -methylamino)methyl, 059		Radicals from acetylserineamide, 072
C <sub>3</sub> H <sub>6</sub> NO <sub>3</sub>	2-Amino-2-carboxy-1-hydroxyethyl, 100		1-Hydroxycyclopentyl, 085
C <sub>3</sub> H <sub>6</sub> O <sub>2</sub> <sup>-</sup>	Electron adduct of methyl acetate, 148		Radicals from cyclopentene + OH, 016a
C <sub>3</sub> H <sub>7</sub>	1-Methylethyl, 002a		2-Carboxy-2,2-dimethylethyl, 006
C <sub>3</sub> H <sub>7</sub> O	1-Hydroxy-1-methylethyl, 078		1-Formyl-4-hydroxybutyl, 028
	1-Hydroxypropyl, 077		Radicals from ribose + OH, 109
	2-Hydroxypropyl, 015		Radicals from deoxyribose + OH, 108
C <sub>3</sub> H <sub>7</sub> O <sub>2</sub>	1,2-Dihydroxypropyl, 102		Radicals from xylitol, 031
	Dimethoxymethyl, 124		Radicals from ribose phosphate + OH, 110
	(Methoxymethoxy)methyl, 094a		Radicals from pentane, 003
C <sub>3</sub> H <sub>7</sub> O <sub>2</sub>	Radicals from allyl alcohol + OH, 018		Radicals from glycylsarcosine + OH, 066
C <sub>3</sub> H <sub>7</sub> O <sub>3</sub>	1,2,3-Trihydroxypropyl, 106		1,1-Dimethylethoxymethyl, 093a
			1-Hydroxypentyl, 082
			1,3-Dihydroxy-2,2-di(hydroxymethyl)propyl, 096
			Radical from ascorbate + OH, 113
			Electron adduct of sorbate, 139

$C_6H_8O_4^-$	Electron adduct of dimethyl fumarate, 141	$C_6H_{14}N$	1-( <i>N,N</i> -Diethylamino)ethyl, 051
$C_6H_9N_2O_2$	Radical from alanine anhydride + OH, 063	$C_7H_{13}O$	(Cyclohexyl)hydroxymethyl, 083
	Radical from sarcosine anhydride + OH, 064		1-Hydroxycycloheptyl, 087
$C_6H_9N_2O_4$	Radicals from acetyldiglycine + OH, 067	$C_9H_{12}N_3O_5$	Radicals from acetyltriglycine + OH, 069
$C_6H_9O$	2-Oxocyclohexyl, 025	$C_8H_{14}N_3O_5^-$	Electron adduct of acetyltriglycine, 145
$C_6H_{10}N_2O_4$	Radicals from acetylasparagine + OH, 073	$C_8H_{15}O$	1-Hydroxycyclooctyl, 088
$C_6H_{10}N_3O_4$	Radicals from triglycine + OH, 068	$C_8H_{19}N^+$	Triethylammonioethyl, 052
$C_6H_{11}N_2O_2^-$	Electron adduct of alanine anhydride, 143	$C_{11}H_{18}N_3O_5$	Radicals from acetyltrialanine + OH, 070
	Electron adduct of sarcosine anhydride, 144		Radicals from acetyltrisarcosine + OH, 071
$C_6H_{11}O$	1-Hydroxycyclohexyl, 086	$C_{12}H_{21}O_{12}$	Radicals from sucrose + OH, 112
$C_6H_{11}O_2$	1-Formyl-5-hydroxypentyl, 029	$C_{12}H_{24}O_4S^-$	Radicals from sodium dodecylsulfate, 092
$C_6H_{11}O_5$	Radicals from sorbitol, 033	$C_{18}H_{28}O_2^-$	Radicals from linolenate + OH, 009
$C_6H_{11}O_6$	Radicals from glucose + OH, 111	$C_{18}H_{30}O_2^-$	Radicals from linoleate + OH, 008
$C_6H_{12}N_2O_3^-$	Electron adduct of acetylglycylglycinamide, 146	$C_{18}H_{32}O_2^-$	Radicals from oleate + OH, 007
$C_6H_{12}N_4O_2^-$	Electron adduct of Diamide, 133	$C_{20}H_{30}O_2^-$	Radicals from arachidonate + OH, 010

## Substrate Formula Index

Substrates for radical reactions are indexed by molecular formula. Entry numbers for the reactions in tables 1-3 are listed following the name.

Ag <sup>+</sup>	Silver(I) ion, 1	C <sub>3</sub> H <sub>7</sub> NO <sub>2</sub> S	Cysteine, 162
Ag <sub>2</sub> <sup>+</sup>	Silver(I) ion, complex with Ag(0), 2	C <sub>3</sub> H <sub>8</sub> O	1-Propanol, 313
BH <sub>3</sub> O <sub>3</sub>	Boric acid, 367	C <sub>3</sub> H <sub>10</sub> N <sup>+</sup>	2-Propanol, 314
BH <sub>4</sub> O <sub>4</sub> <sup>-</sup>	Tetrahydroborate ion, 366	C <sub>4</sub> H <sub>2</sub> N <sub>2</sub> O <sub>4</sub>	Trimethylammonium ion, 371
BrCoH <sub>15</sub> N <sub>5</sub> <sup>2+</sup>	Pentaamminecobalt(III) ion, 15	C <sub>4</sub> H <sub>3</sub> BrN <sub>2</sub> O <sub>2</sub>	Alloxan, 126
BrH <sub>15</sub> N <sub>5</sub> Ru <sup>2+</sup>	Bromopentaammineruthenium(III) ion, 101	C <sub>4</sub> H <sub>3</sub> NO <sub>2</sub> S	5-Bromouracil, 146
BrO <sub>3</sub> <sup>-</sup>	Bromate ion, 3	C <sub>4</sub> H <sub>3</sub> N <sub>3</sub> O <sub>4</sub>	2-Nitrothiophene, 298
Br <sub>2</sub> Hg	Mercuric bromide, 74	C <sub>4</sub> H <sub>3</sub> O <sub>4</sub> <sup>-</sup>	3-Nitrothiophene, 299
CCl <sub>4</sub>	Carbon tetrachloride, 152	C <sub>4</sub> H <sub>4</sub> N <sub>2</sub>	5-Nitrouracil, 301
CHCl <sub>3</sub>	Chloroform, 157	C <sub>4</sub> H <sub>4</sub> N <sub>2</sub> O <sub>2</sub>	Fumarate ion, 214
CHO <sub>2</sub> <sup>-</sup>	Formate ion, 212	C <sub>4</sub> H <sub>4</sub> O <sub>4</sub>	Pyrazine, 321
CHO <sub>3</sub> <sup>-</sup>	Bicarbonate ion, 370	C <sub>4</sub> H <sub>5</sub> N <sub>3</sub>	Pyridazine, 324
CH <sub>2</sub> Cl <sub>2</sub>	Dichloromethane, 174	C <sub>4</sub> H <sub>5</sub> N <sub>3</sub> O <sub>2</sub>	Pyrimidine, 329
CH <sub>2</sub> O	Formaldehyde, 211	C <sub>4</sub> H <sub>6</sub>	2-Nitropyrrole, 295
CH <sub>3</sub> NO <sub>2</sub>	Nitromethane, 292	C <sub>4</sub> H <sub>6</sub> N <sub>2</sub> O <sub>2</sub>	3-Nitropyrrole, 296
CH <sub>3</sub> O	Methanol, 255	C <sub>4</sub> H <sub>6</sub> O <sub>2</sub>	Fumaric acid, 215
CH <sub>4</sub> S	Methanethiol, 254	C <sub>4</sub> H <sub>7</sub> N	Maleic acid, 252
CHgN	Mercurous cyanide, 77	C <sub>4</sub> H <sub>8</sub>	4-Aminopyrimidine, 129
CN <sub>4</sub> O <sub>3</sub>	Tetranitromethane, 347	C <sub>4</sub> H <sub>8</sub> O	2-Methyl-5-nitroimidazole, 264
C <sub>2</sub> Cl <sub>3</sub> O <sub>2</sub> <sup>-</sup>	Trichloroacetate ion, 351	C <sub>4</sub> H <sub>8</sub> O <sub>2</sub>	Butadiene, 147
C <sub>2</sub> F <sub>3</sub> O <sub>2</sub> <sup>-</sup>	Trifluoroacetate ion, 352	C <sub>4</sub> H <sub>5</sub> N <sub>3</sub>	Glycine anhydride, 218
C <sub>2</sub> H <sub>2</sub>	Acetylene, 119	C <sub>4</sub> H <sub>5</sub> N <sub>3</sub> O <sub>2</sub>	2,3-Butanedione, 148
C <sub>2</sub> H <sub>2</sub> IN	Iodoacetonitrile, 237	C <sub>4</sub> H <sub>6</sub>	Isobutyronitrile, 243
C <sub>2</sub> H <sub>2</sub> IO <sub>2</sub> <sup>-</sup>	Iodoacetate ion, 235	C <sub>4</sub> H <sub>6</sub> N <sub>2</sub> O <sub>2</sub>	1-Butene, 149
C <sub>2</sub> H <sub>3</sub> ClO <sub>2</sub>	Chloroacetic acid, 156	C <sub>4</sub> H <sub>8</sub>	Isobutylene, 241
C <sub>2</sub> H <sub>3</sub> Cl <sub>3</sub> O <sub>2</sub>	Chloral hydrate, 155	C <sub>4</sub> H <sub>8</sub> O	Tetrahydrofuran, 340
C <sub>2</sub> H <sub>3</sub> IO <sub>2</sub>	Iodoacetic acid, 236	C <sub>4</sub> H <sub>8</sub> O <sub>2</sub>	Ethyl acetate, 201
C <sub>2</sub> H <sub>3</sub> N	Acetonitrile, 117	C <sub>4</sub> H <sub>10</sub> N <sup>+</sup>	Isobutyric acid, 242
C <sub>2</sub> H <sub>4</sub>	Ethylene, 202	C <sub>4</sub> H <sub>10</sub> O	Methyl propionate, 267
C <sub>2</sub> H <sub>4</sub> Cu <sup>+</sup>	Copper(I) ion, complex with ethylene, 58	C <sub>4</sub> H <sub>10</sub> O <sub>2</sub> S <sub>2</sub>	Pyrrolidinium ion, 376
C <sub>2</sub> H <sub>4</sub> INO	Iodoacetamide, 234	C <sub>4</sub> H <sub>12</sub> N <sup>+</sup>	Ethyl ether, 205
C <sub>2</sub> H <sub>4</sub> O <sub>2</sub>	Acetic acid, 115	C <sub>4</sub> H <sub>12</sub> N <sub>2</sub> S <sub>2</sub>	Dithiothreitol, 197
C <sub>2</sub> H <sub>4</sub> O <sub>3</sub>	Glycolic acid, 219	C <sub>4</sub> H <sub>12</sub> N <sub>2</sub> O <sub>2</sub>	Diethylammonium ion, 373
C <sub>2</sub> H <sub>5</sub> IO	Iodoethanol, 238	C <sub>4</sub> H <sub>16</sub> BrCoFN <sub>4</sub> <sup>+</sup>	Cystamine, 160a
C <sub>2</sub> H <sub>5</sub> NO <sub>2</sub>	Glycine, 217, 378	C <sub>4</sub> H <sub>16</sub> Br <sub>2</sub> CoN <sub>4</sub> <sup>+</sup>	<i>cis</i> -Bromobis(ethylenediamine) fluorocobalt(III) ion, 40
C <sub>2</sub> H <sub>6</sub> O	Ethanol, 200	C <sub>4</sub> H <sub>16</sub> Cl <sub>2</sub> CoN <sub>4</sub> <sup>+</sup>	<i>trans</i> -Dibromobis(ethylenediamine) cobalt(III) ion, 39
C <sub>2</sub> H <sub>6</sub> OS	2-Mercaptoethanol, 253	C <sub>4</sub> H <sub>16</sub> Cl <sub>2</sub> CoN <sub>4</sub> <sup>+</sup>	<i>cis</i> -Dichlorobis(ethylenediamine) cobalt(III) ion, 41
C <sub>2</sub> H <sub>6</sub> O <sub>2</sub>	Ethylene glycol, 204	C <sub>4</sub> H <sub>16</sub> Cl <sub>2</sub> N <sub>4</sub> Pt <sup>2+</sup>	<i>trans</i> -Dichlorobis(ethylenediamine) cobalt(III) ion, 42
C <sub>2</sub> H <sub>7</sub> NS	Cysteamine, 161	C <sub>4</sub> H <sub>16</sub> CoF <sub>2</sub> N <sub>4</sub> <sup>+</sup>	<i>trans</i> -Dichlorobis(ethylenediamine)-platinum(IV) ion, 97
C <sub>2</sub> H <sub>8</sub> N <sup>+</sup>	Ethylammonium ion, 372	C <sub>4</sub> H <sub>18</sub> ClCoN <sub>4</sub> O <sup>2+</sup>	<i>trans</i> -Bis(ethylenediamine) difluorocobalt(III) ion, 43
C <sub>2</sub> H <sub>10</sub> CoN <sub>5</sub> O <sub>2</sub> <sup>+</sup>	(Acetato)pentaamminecobalt(III) ion, 20	C <sub>4</sub> H <sub>19</sub> ClCoN <sub>5</sub> <sup>2+</sup>	<i>cis</i> -Aquachlorobis(ethylene-diamine)cobalt(III) ion, 38
C <sub>2</sub> HgN <sub>2</sub>	Mercuric cyanide, 78	C <sub>4</sub> H <sub>19</sub> ClCoN <sub>5</sub> <sup>2+</sup>	<i>cis</i> -Amminechlorobis(ethylene-diamine)cobalt(III) ion, 37
C <sub>2</sub> HgN <sub>2</sub> S <sub>2</sub>	Mercuric thiocyanate, 79	C <sub>4</sub> N <sub>4</sub> Ni <sup>2-</sup>	Tetracyanonickelate(II) ion, 90
C <sub>3</sub> HBrNO <sub>2</sub> S	2-Bromo-5-nitrothiazole, 145	C <sub>5</sub> FeN <sub>6</sub> O <sup>3-</sup>	Pentacyanonitrosylferrate(III) ion, 70
C <sub>3</sub> H <sub>3</sub> NO <sub>2</sub>	Cyanoacetic acid, 160	C <sub>5</sub> FeN <sub>6</sub> O <sup>4-</sup>	Pentacyanonitrosylferrate(III) radical ion (electron adduct), 71
C <sub>3</sub> H <sub>3</sub> NS	Thiazole, 349	C <sub>5</sub> H <sub>2</sub> NO <sub>5</sub> <sup>-</sup>	5-Nitrofuoroate ion, 288
C <sub>3</sub> H <sub>3</sub> N <sub>3</sub> O <sub>2</sub>	2-Nitroimidazole, 289	C <sub>5</sub> H <sub>3</sub> N <sub>2</sub> O <sub>4</sub>	Orotate ion, 303
C <sub>3</sub> H <sub>3</sub> N <sub>3</sub> O <sub>2</sub> S	4-Nitroimidazole, 290	C <sub>5</sub> H <sub>3</sub> N <sub>2</sub> O <sub>4</sub>	Pyrazinecarboxylic acid, 322
C <sub>3</sub> H <sub>3</sub> N <sub>3</sub> O <sub>2</sub> S	2-Amino-5-nitrothiazole, 127	C <sub>5</sub> H <sub>4</sub> N <sub>2</sub> O <sub>4</sub>	Nifuroxime, 278
C <sub>3</sub> H <sub>3</sub> O <sub>3</sub> <sup>-</sup>	Pyruvate ion, 330	C <sub>5</sub> H <sub>4</sub> N <sub>4</sub>	Purine, 320
C <sub>3</sub> H <sub>3</sub> IO <sub>2</sub>	3-Iodopropionic acid, 239	C <sub>5</sub> H <sub>4</sub> O <sub>5</sub> <sup>2-</sup>	α-Ketoglutarate ion, 246
C <sub>3</sub> H <sub>5</sub> N	Propionitrile, 316	C <sub>5</sub> H <sub>10</sub> O	3-Pentanone, 305
C <sub>3</sub> H <sub>5</sub> NO	Acrylamide, 123	C <sub>5</sub> H <sub>11</sub> NO <sub>2</sub> S	Penicillamine, 304
C <sub>3</sub> H <sub>5</sub> O <sub>2</sub> <sup>-</sup>	3-Hydroxypropionitrile, 230	C <sub>5</sub> H <sub>12</sub> N <sup>+</sup>	Piperidinium ion, 377
C <sub>3</sub> H <sub>5</sub> O <sub>3</sub> <sup>-</sup>	3-Mercaptopropionate ion, 253a	C <sub>5</sub> H <sub>15</sub> CoN <sub>6</sub> O <sub>2</sub> <sup>2+</sup>	Tetraammine(pyrazinecarboxylato- <i>O,N</i> ) cobalt(III) ion, 34
C <sub>3</sub> H <sub>6</sub>	Propylene, 317	C <sub>5</sub> H <sub>16</sub> CoN <sub>7</sub> O <sub>2</sub> <sup>2+</sup>	Pentaammine(pyrazinecarboxylato)-
C <sub>3</sub> H <sub>6</sub> O	Acetone, 116		
C <sub>3</sub> H <sub>6</sub> O <sub>2</sub>	Propionic acid, 315		
C <sub>3</sub> H <sub>6</sub> O <sub>3</sub>	Lactic acid, 248		



$C_5H_{20}CoN_6^{3+}$	cobalt(III) ion, 33	$C_7H_8NO^+$	3-Carboxy-1-methylpyridinium ion, 153
$C_5H_{23}Co_2N_8O_4^{3+}$	Pentaammine(pyridine)cobalt(III) ion, 31	$C_7H_9ClN_2O$	4-Carboxy-1-methylpyridinium ion, 154
$C_6Cl_4O_2$	Hexaamminebis( $\mu$ -hydroxy)[ $\mu$ -(pyrazine-carboxylato)]dicobalt(III) ion, 35	$C_7H_9N_2O^+$	2-Pyridinecarboxaldoxime methochloride, 326
$C_6FeN_6^{3-}$	Tetrachlorobenzoquinone, 338	$C_7H_{11}N_3O_3$	3-Carbamoyl-1-methylpyridinium ion, 151
$C_6H_2N_3O_9S^-$	Ferricyanide ion, 69	$C_7H_{18}CoN_7O_6^{2+}$	Misonidazole, 272
$C_6H_4ClNO_2$	Trinitrobenzenesulfonate ion, 355		Pentaammine(2,4-dinitrobenzoato)cobalt(III) ion, 27
$C_6H_4N_2O_4$	<i>p</i> -Chloronitrobenzene, 158		Pentaammine(3,5-dinitrobenzoato)cobalt(III) ion, 28
	1,2-Dinitrobenzene, 187	$C_7H_{19}CoN_6O_4^{2+}$	Pentaammine(4-nitrobenzoato)cobalt(III) ion, 26
	1,3-Dinitrobenzene, 188		Pentaammine(2-nitrobenzoato)cobalt(III) ion, 24
	1,4-Dinitrobenzene, 189		Pentaammine(3-nitrobenzoato)cobalt(III) ion, 25
$C_6H_4N_4$	Pteridine, 318		Pentaammine(benzoato)cobalt(III) ion, 23
$C_6H_4N_4O_2$	Lumazine, 250	$C_7H_{20}CoN_5O_2^{2+}$	Hexaamminebis( $\mu$ -hydroxy)[ $\mu$ -(4-nitrobenzoato)]dicobalt(III) ion, 29
$C_6H_4O_2$	Benzoquinone, 138	$C_7H_{24}Co_2N_7O_6^{3+}$	2-Nitroisophthalate ion, 291
$C_6H_5NO$	Nitrosobenzene, 297		3-Methyl-2-nitrobenzoate ion, 263
$C_6H_5NO_2$	Isonicotinic acid, 245	$C_8H_3NO_6^{2-}$	Quinoxaline, 331
	Nicotinic acid, 277	$C_8H_6NO_4^-$	<i>p</i> -Nitroacetophenone, 279
	Nitrobenzene, 283	$C_8H_6N_2$	Acetophenone, 118
$C_6H_5NO_3$	<i>o</i> -Nitrophenol, 294	$C_8H_7NO_3$	2,3-Dimethylbenzoquinone, 180
$C_6H_5NO_4$	1,3-Dihydroxy-2-nitrobenzene, 178	$C_8H_8O$	2,5-Dimethylbenzoquinone, 181
$C_6H_5N_5O$	Pterin, 319	$C_8H_8O_2$	2,6-Dimethylbenzoquinone, 182
$C_6H_5O^-$	Phenoxide ion, 309		3-Methoxy-2-nitrotoluene, 257
$C_6H_6CoN_3O_6^-$	Nitritolactatocobalt(II) ion, 11	$C_8H_9NO_3$	4-Ethylphenoxide ion, 207
$C_6H_6NO^-$	4-Aminophenoxide ion, 128	$C_8H_{10}NO_6P$	Pyridoxal-5-phosphate, 327
$C_6H_6N_2O$	Isonicotinamide, 244	$C_8H_{10}N_2O$	<i>N,N</i> -Dimethyl-4-nitrosoaniline, 185a
	Nicotinamide, 275	$C_8H_{11}NO_2$	2-(3,4-Dihydroxyphenyl)ethylamine, 179
	4-Pyridinecarboxaldoxime, 325	$C_8H_{11}NO_3$	Pyridoxine, 328
$C_6H_6N_2O_2$	<i>o</i> -Nitroaniline, 280	$C_8H_{12}CuN_4O_3$	Glycylhistidincopper(II) complex, 64
	<i>m</i> -Nitroaniline, 281	$C_8H_{12}NO_2$	Norpseudopelletierine- <i>N</i> -oxyl, 302
	<i>p</i> -Nitroaniline, 282	$C_8H_{13}O_2S_2^-$	Lipoate ion, 249
	9-Methylpurine, 269	$C_8H_{19}N_6O_2^{2+}$	Pentaammine(4-cyanobenzoato)cobalt(III) ion, 80
$C_6H_6N_4$	1,2-Dihydroxybenzene, 176	$C_8H_{21}CoN_6O_4^{2+}$	Pentaammine(4-nitrophenylacetato)cobalt(III) ion, 22
$C_6H_6O_2$	1,3-Dihydroxybenzene, 177		Pentaammine(phenylacetato)cobalt(III) ion, 21
	Hydroquinone, 227	$C_8H_{22}CoN_5O_2^{2+}$	3-Iodotyrosine, 240
	Aniline, 130	$C_9H_{10}INO_3$	2,3,5-Trimethylbenzoquinone, 353
$C_6H_7NO_2$	<i>N</i> -Ethylmaleimide, 206	$C_9H_{10}O_2$	Tyrosine, 358
$C_6H_7O_6^-$	Ascorbate ion, 135	$C_9H_{11}NO_3$	2,2,5,5-Tetramethyl-3-pyrrolin-1-yloxy-3-carboxamide, 346
$C_6H_8N_2$	<i>o</i> -Phenylenediamine, 310	$C_9H_{15}N_2O_2$	2,2,6,6-Tetramethyl-4-oxo-1-piperidin-yloxy, 342
	<i>p</i> -Phenylenediamine, 311		2,2,5,5-Tetramethyl-1-pyrrolidin-yloxy-3-carboxamide, 345
$C_6H_8O_4$	Dimethyl fumarate, 184	$C_9H_{16}NO_2$	2,2,6,6-Tetramethyl-4-hydroxy-1-piperidin-yloxy, 343
$C_6H_9N_3O_3$	Metronidazole, 271		1,2,4,5-Tetracyanobenzene, 339
$C_6H_{11}CuN_3O_4^{2+}$	Glycylglycylglycinatocopper(II) complex, 61	$C_9H_{17}N_2O_2$	1,4-Naphthoquinone-2-sulfonate ion, 274
	Diamide, 170	$C_9H_{18}NO_2$	1,4-Naphthoquinone, 273
$C_6H_{12}N_4O_2$	Diamide, 170		2-Hydroxy-1,4-naphthoquinone, 228
$C_6H_{14}N^+$	Cyclohexylammonium ion, 375	$C_{10}H_2N_4$	2,2'-Bipyridine, 143
$C_6H_{16}N^+$	Triethylammonium ion, 374	$C_{10}H_5O_5S^-$	Ethylenediaminetetraacetatocuprate(I) ion, 58a
$C_6H_{19}CoN_6O_2^{2+}$	Pentaammine(pyridinecarboxylato)cobalt(III) ion, 32	$C_{10}H_6O_2$	Ethylenediaminetetraacetatocuprate(II) ion, 65a
	Tris(ethylenediamine)cobalt(III) ion, 36	$C_{10}H_6O_3$	Duroquinone, 198
$C_6H_2N_3O_8^-$	2,4,6-Trinitrobenzoate ion, 356	$C_{10}H_8N_2$	Adenosine, 124
$C_7H_3N_2O_6^-$	2,4-Dinitrobenzoate ion, 190	$C_{10}H_{12}CuN_2O_8^3$	$\beta$ -Alanylhistidincopper(II) complex, 65
	2,5-Dinitrobenzoate ion, 191	$C_{10}H_{12}CuN_2O_8^{2-}$	Adenosine monophosphate, 125
	3,4-Dinitrobenzoate ion, 192	$C_{10}H_{12}O_2$	<i>N,N,N',N'</i> -Tetramethyl- <i>p</i> -phenylenediamine, 344
	3,5-Dinitrobenzoate ion, 193	$C_{10}H_{13}N_5O_4$	Camphor, 150
$C_7H_3N_3O_4$	3,5-Dinitrobenzotrile, 194	$C_{10}H_{14}CuN_4O_3$	Glutathione, 215a
$C_7H_4ClN$	<i>m</i> -Chlorobenzonitrile, 156a	$C_{10}H_{14}N_5O_7P$	1-(2,4-Dinitrophenyl)pyridinium ion, 195
$C_7H_4NO_4^-$	<i>o</i> -Nitrobenzoate ion, 284	$C_{10}H_{16}N_2$	2-Methyl-1,4-naphthoquinone, 262
	<i>m</i> -Nitrobenzoate ion, 285		<i>N</i> -Formylkynurenine, 213
	<i>p</i> -Nitrobenzoate ion, 286	$C_{10}H_{16}O$	1-Methylguanosine, 261
	3-Hydroxy-2-nitrobenzoate ion, 229	$C_{10}H_{17}N_3O_6S$	Dichloroindophenol, 173
$C_7H_4NO_5^-$	<i>p</i> -Nitrobenzotrile, 287	$C_{11}H_8N_3O_4^+$	
$C_7H_4N_2O_2$	<i>p</i> -Nitroperoxybenzoic acid, 293	$C_{11}H_8O_2$	
$C_7H_5NO_5$	3,5-Dinitroanisole, 186	$C_{11}H_9N_2O_4$	
$C_7H_6N_2O_5$	2-Methylbenzoquinone, 259	$C_{11}H_{15}N_5O_5$	
$C_7H_6O_2$	3-Acetylpyridine, 120	$C_{12}H_7ClNO$	
$C_7H_7NO$	<i>o</i> -Nitrotoluene, 300		
$C_7H_7NO_2$	3-Methyl-2-nitrophenol, 265		
$C_7H_7NO_3$	3-Methylpterin, 268		
$C_7H_7N_5O$	4-Methylphenoxide ion, 266		
$C_7H_7O^-$	4-Methoxyphenoxide ion, 258		
$C_7H_7O_2^-$			

$C_{12}H_8N_2$	1,10-Phenanthroline, 306 Phenazine, 307	$C_{10}H_{16}N_7O_6$	Folic acid, 210
$C_{12}H_9NO$	3-Benzoylpyridine, 141 4-Benzoylpyridine, 142 Indophenol, 233 Thionine, 350	$C_{20}H_6Br_4O_5^{2-}$	Eosin, 199
$C_{12}H_9N_3S$	Azobenzene, 136	$C_{20}H_{10}O_5^{2-}$	Fluorescein, 209
$C_{12}H_{10}N_2$	2,3-Dimethylnaphthoquinone, 185	$C_{20}H_{19}N_4^+$	Safranine T, 336
$C_{12}H_{10}O_2$	1,1'-Ethylene-2,2'-bipyridinium ion, 203	$C_{21}H_{28}N_7O_{10}P_2$	Nicotinamide-adenine dinucleotide, 276
$C_{12}H_{12}N_2^{2+}$	1,1'-Dimethyl-4,4'-bipyridinium ion, 183	$C_{22}H_{18}N_2^{2+}$	1,1'-Diphenyl-4,4'-bipyridinium ion, 196
$C_{12}H_{14}N_2^{2+}$	Thiamine, 348	$C_{24}H_{16}N_4^{2+}$	1,1'-Di(4-cyanophenyl)-4,4'-bipyridinium ion, 175
$C_{12}H_{17}ClN_4OS$	Histidinecopper(II) complex, 63	$C_{24}H_{22}N_2^{2+}$	1,1'-Dibenzyl-4,4'-bipyridinium ion, 171
$C_{12}H_{18}CuN_6O_4$	2-Benzoylpyridine, 140	$C_{25}H_{30}ClN_3$	Crystal Violet, 159
$C_{12}N_9NO$	Acridine, 121	$C_{28}H_{31}N_2O_3^+$	Rhodamine B, 332
$C_{13}H_9N$	Benzophenone, 137	$C_{30}H_{24}CoN_6^{3+}$	Tris(2,2'-bipyridine)cobalt(III) ion, 44
$C_{13}H_{10}O$	3-Benzoyl-1-methylpyridinium ion, 139	$C_{30}H_{24}N_6Rh^{3+}$	Tris(2,2'-bipyridine)rhodium(III) ion, 98
$C_{13}H_{12}NO^+$	1,1-Trimethylene-2,2'-bipyridinium ion, 354	$C_{30}H_{24}N_6Ru^{2+}$	Tris(2,2'-bipyridine)ruthenium(II) ion, 99
$C_{13}H_{14}N_2^{2+}$	9,10-Anthraquinone-2,6-disulfonate ion, 134	$C_{30}H_{24}N_6Ru^{3+}$	Tris(2,2'-bipyridine)ruthenium(III) ion, 105
$C_{14}H_6O_7S_2^{2-}$	9,10-Anthraquinone-1-sulfonate ion, 132	$C_{30}H_{28}FeN_4O_6$	Deuteroheme, 223
$C_{14}H_7O_5S^-$	9,10-Anthraquinone-2-sulfonate ion, 133	$C_{30}H_{28}FeN_4O_6^+$	Deuterohemin, 222
$C_{14}H_8O_2$	9,10-Anthraquinone, 131	$C_{31}H_{46}O_2$	Vitamin K <sub>1</sub> , 360
$C_{14}H_{14}ClN_3$	Acriflavin, 122	$C_{32}H_{34}N_4O_6$	Deuteroporphyrin dimethyl ester, 221a
$C_{14}H_{16}N_2^{2+}$	1,1'-Tetramethylene-2,2'-bipyridinium ion, 341	$C_{34}H_{24}N_6Na_4O_{14}S_4$	Trypan blue, 357
$C_{14}H_{18}N_2O_2^{2+}$	1,1'-Bis(2-hydroxyethyl)-4,4'-bipyridinium ion, 144	$C_{34}H_{32}ClFeN_4O_4$	Hemin, 224
$C_{14}H_{26}CoN_4O_2^+$	Dihydroxy(2,3,9,10-tetramethyl-1,4,8,11-tetraazacyclotetradeca-1,3,8,10-tetraene)cobalt(III) ion, 52	$C_{34}H_{38}N_4O_6$	Hematoporphyrin, 220
$C_{14}H_{27}CoN_4O_2^{2+}$	Aquahydroxy(2,3,9,10-tetramethyl-1,4,8,11-tetraazacyclotetradeca-1,3,8,10-tetraene)cobalt(III) ion, 51	$C_{36}H_{24}CoN_6^{3+}$	Tris(1,10-phenanthroline)cobalt(III) ion, 45
$C_{14}H_{28}CoN_4O_2^{2+}$	Diaqua(2,3,9,10-tetramethyl-1,4,8,11-tetraazacyclotetradeca-1,3,8,10-tetraene)cobalt(II) ion, 7	$C_{36}H_{24}FeN_6^{3+}$	Tris(1,10-phenanthroline)iron(III) ion, 72
$C_{14}H_{28}CoN_4O_2^{3+}$	Diaqua(2,3,9,10-tetramethyl-1,4,8,11-tetraazacyclotetradeca-1,3,8,10-tetraene)cobalt(III) ion, 50	$C_{36}H_{24}N_6Rh^{3+}$	Tris(1,10-phenanthroline)rhodium(III) ion, 98a
$C_{16}H_6N_2O_{14}S_4^{4-}$	Indigo tetrasulfonate, 232	$C_{36}H_{24}N_6Ru^{2+}$	Tris(1,10-phenanthroline)ruthenium(II) ion, 99a
$C_{16}H_8N_2O_8S_2^{2-}$	Indigo disulfonate, 231	$C_{40}H_{30}N_{10}O_6^{2+}$	Nitro blue tetrazolium, 287a
$C_{16}H_{10}$	Pyrene, 323	$C_{40}H_{46}ClFeN_6O_5S_2$	Hemin c, 225
$C_{16}H_{16}N_2O_4$	1,1'-Dicarboxyethyl-4,4'-bipyridinium, 172	$C_{42}H_{58}CoN_6^{3+}$	Tris(5,6-dimethyl-1,10-phenanthroline)cobalt(III) ion, 45a
$C_{16}H_{18}N_3S^+$	Methylene blue, 260	$C_{48}H_{30}N_4O_8$	<i>meso</i> -5-Tetra(4-carboxyphenyl)porphyrin, 337
$C_{16}H_{32}Cl_2CoN_4^+$	Dichloro(5,7,7,12,14,14-hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-diene)cobalt(III) ion, 49	$C_{62}H_{90}CoN_{13}O_{14}P$	Cobal(II)amin, 10
$C_{16}H_{32}CuN_4^{2+}$	(5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-diene)cobalt(II) ion, 60	$C_{62}H_{91}CoN_{13}O_{15}P$	Hydroxocob(III)alamin(Vitamin B12a), 54
$C_{16}H_{32}N_4Ni^{2+}$	(5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-diene)nickel(II) ion, 92	$C_{63}H_{90}CoN_{14}O_{14}P$	Cyanocob(III)alamin(Vitamin B12), 53
$C_{16}H_{34}CoN_4O_2^+$	(5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-diene)dihydroxycobalt(III) ion, 48	$C_{64}H_{24}CoN_{16}O_{24}S_8^{8-}$	3,10,17,24-Tetrasulfophthalocyaninecobalt(II) ion dimer, 10a
$C_{16}H_{35}CoN_4O_2^{2+}$	Aqua(5,7,7,12,14,14-hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-diene)hydroxycobalt(III) ion, 47	$Cd^+$	Cadmium(I) ions, 4
$C_{16}H_{36}CoN_4O_2^{2+}$	Diaqua(5,7,7,12,14,14-hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-diene)cobalt(II) ion, 9	$Cd^{2+}$	Cadmium(II) ion, 5
$C_{16}H_{36}CoN_4O_2^{3+}$	Diaqua(5,7,7,12,14,14-hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-diene)cobalt(III) ion, 46	$ClCoH_{15}N_5^{2+}$	Pentaamminechlorocobalt(III) ion, 16
$C_{16}H_{36}N_4Ni^{2+}$	(5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradecane)nickel(II) ion, 91	$ClH_{15}N_5Ru^{2+}$	Chloropentaammineruthenium(III) ion, 102
$C_{17}H_{20}N_2S$	Promethazine, 312	$Cl_2Hg$	Mercuric chloride, 75
$C_{17}H_{20}N_4O_6$	Riboflavin, 333	$Cl_4Ir^{2+}$	Hexachloroiridate(II) ion, 81a
$C_{17}H_{20}N_4O_5P^-$	Riboflavin 5'-phosphate, 334	$Co^{2+}$	Cobalt(II) ions, 6
$C_{18}H_{15}N_4^+$	Phenosafarine, 308	$CoFH_{15}N_5^{2+}$	Pentaamminefluorocobalt(III) ion, 17
		$CoH_{15}N_6O_2^{2+}$	Pentaammine(nitrito- <i>N</i> )cobalt(III) ion, 18
		$CoH_{16}N_6O_3^{2+}$	Pentaammine(nitrito- <i>O</i> )cobalt(III) ion, 19
		$CoH_{16}N_5O^{2+}$	Pentaamminehydroxycobalt(III) ion, 14
		$CoH_{17}N_6O^{3+}$	Pentaammineaquacobalt(III) ion, 13
		$CoH_{18}N_6^{3+}$	Hexaamminecobalt(III) ion, 12
		$Cr^{2+}$	Chromium(II) ion, 55
		$Cr^{3+}$	Chromium(III) ion, 56
		$Cu^+$	Copper(I) ions, 57
		$Cu^{2+}$	Copper(II) ions, 59
		$Eu^{3+}$	Europium(III) ion, 66
		$Fe^{2+}$	Iron(II) ion, 67
		$Fe^{3+}$	Iron(III) ions, 68
		$Ga^{2+}$	Gallium(II) ions, 73
		$HO^-$	Hydroxide ion, 362
		$HO_2P_2^{3-}$	Pyrophosphate ion, 369
		$H_2O$	Water, 363
		$H_2O_2$	Hydrogen peroxide, 94
		$H_2O_4P^-$	Phosphate ion, 368
		$H_2S$	Hydrogen sulfide, 106
		$H_3N$	Ammonia, 365
		$H_3NO$	Hydroxylamine, 84
		$H_3O^+$	Hydronium ion, 361
		$H_4N^+$	Ammonium ion, 364
		$H_{15}N_6ORu^{3+}$	Nitrosopentaammineruthenium(III) ion, 103

$H_{15}N_6ORu^{z+}$	Nitrosopentaammineruthenium(III) radical ion (electron adduct), 104	$O_2$	Oxygen, 93
$H_{18}N_6Ru^{3+}$	Hexaammineruthenium(III) ion, 100	$O_2S$	Sulfur dioxide, 107
$HgI_2$	Mercuric iodide, 76	$O_6S_4^{2-}$	Tetrathionate ion, 108
$IO_3^-$	Iodate ion, 81	$Pb^+$	Lead(I) ions, 95
$I_2$	Iodine, 80	$Pb^{2+}$	Lead(II) ions, 96
$Mn^{2+}$	Manganese(II) ions, 82	$Sc^{2+}$	Scandium(II) ions, 109
$MnO_4^-$	Permanganate ion, 83	$Ti^{3+}$	Titanium(III) ions, 110
$NO_2^-$	Nitrite ion, 86	$Tl^+$	Thallium(I) ion, 111
$NO_3^-$	Nitrate ion, 87	$Tl_2^+$	Thallium(I) ion, complex with $Tl(0)$ , 111a
$N_2O$	Nitrous oxide, 85	$Yb^{3+}$	Ytterbium(III) ions, 112
$Ni^+$	Nickel(I) ion, 88	$Zn^+$	Zinc(I) ion, 113
$Ni^{2+}$	Nickel(II) ions, 89	$Zn^{2+}$	Zinc(II) ion, 114

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