

TABLE II
Rates of decomposition of organic compounds containing a β -carbonyl group

Group type (R = H or hydrocarbon) Examples	Type of reaction ^a	Conditions ($t_{1/2}$ at given temp.) ^{b, c}	$t_{1/2}$ at 50 °C ^d	References
-CO-CR₂-COOH				
A. acetoacetic acid	decarbox.	aq. 30 °C (0.28 d)		(Guthrie and Jordan, 1972)
B. acetoacetate	decarbox.	aq. 30 °C (17.6 d)		
C. acetoacetic acid	decarbox.	0.01 M aq. 37, 35, 18 °C (0.231, 1.12, 2.99 d)	0.05 d	(Pedersen, 1929)
D. acetoacetate	decarbox.	0.01 M aq. 37, 25, 18 °C (12.5, 54, 134 d)	2.9 d	
E. 2,2'-dimethyl-acetoacetic acid	decarbox.	0.01 M 18 °C (0.67 d)		(Pedersen, 1929)
F. 2,2'-dimethyl-acetoacetate	decarbox.	0.01 M 18 °C (~120 d)		
G. oxaloacetic acid	decarbox.	aq. 25, 30, 37 °C (7.50, 3.60, 1.39 d)	0.26 d	(Gelles, 1956)
H. oxaloacetate (-1)	decarbox.	aq. 25, 30, 37 °C (0.141, 0.072, 0.031 d)	0.007 d	
I. oxaloacetate (-2)	decarbox.	aq. 25, 30, 37 °C (0.480, 0.241, 0.115 d)	0.027 d	
J. tartronic semiald.	decarbox.	0.01 M aq. 30 °C-buf. pH 5 (5.8 h)		(Fukunaga, 1960)
-CO-CR₂-CO-				
K. acetylacetone	hydro. deacylation	aq. 45 °C-pH 7.3 (12 d)	8.9 d ^c	(Calmon and Maroni, 1968)
L. 5-Me-2,4-hexanedione	hydro. deacylation	aq. 45 °C-pH 7.3 (69 d)	51 d ^c	(Calmon and Maroni, 1968)
-CO-CR₂-COH<				
M. glyceraldehyde (GA)	dehydr., isomer	1 mM aq. 180, 200, 220, 240 °C (207, 83, 39, 21 s)	6.0 d	(Bonn <i>et al.</i> , 1985)
N. glyceraldehyde	dehydr., isomer.	0.06 M aq. 37 °C-buf. pH 7.7 (2.9 d)		(Bonsignore <i>et al.</i> , 1972)
O. dihydroxyacetone (DHA)	dehydr., isomer.	1 mM aq. 180, 200, 220, 240 °C (613, 241, 108, 33 s)	141 d	(Bonn <i>et al.</i> , 1985)
P. triose (GA + DHA)	dehydr., isomer.	0.01 M aq. 40 °C-buf. pH 5.5 [37.6 d]		(Weber, 2001b)
Q. triose (GA + DHA)	dehydr., isomer.	0.01 M aq. 50 °C-buf. pH 7.3 (1.1 d)	1.1 d	(Federonko <i>et al.</i> , 1969)
R. ribose	C-1 transform.	aq. 118, 100, 80, 60 °C-buf. pH 7 (0.21, 1.5, 10, 64 h)	10.2 d	(Larralde <i>et al.</i> , 1995)
S. 2-deoxyribose	C-1 transform.	aq. 100 °C-buf. pH 7 (3.8 h)		(Larralde <i>et al.</i> , 1995)
T. arabinose	C-1 transform.	aq. 100 °C-buf. pH 7 (7.7 h)		(Larralde <i>et al.</i> , 1995)
-CO-CR₂-COH<				
U. idiose	C-1 transform.	aq. 100 °C-buf. pH 7 (0.36 h)		(Larralde <i>et al.</i> , 1995)
V. glucose	C-1 transform	aq. 100 °C-buf. pH 7 (35 h)		(Larralde <i>et al.</i> , 1995)
W. glucose	C-1 transform.	0.2 M aq. 240, 273, 298, 322 °C (102, 21, 7.6, 5.6 s)	352 d	(Adschiri <i>et al.</i> , 1993)
X. fructose	dehydr., isomer., fragm., intramol. redox	0.05 M aq. 250 °C-pH 6 [23 s]		(Antal <i>et al.</i> , 1990)
Y. fructose	dehydr., isomer., intramol. redox	0.25 M aq. 175 °C-buf. pH 5-6 (208 s)		(Kuster and Temmink, 1977)
Z. fructose	dehydr.	0.25 M aq. 175 °C-unbuf. pH 7 drops to pH 3 (2310 s)		(Kuster and Temmink, 1977)
AA. 3-hydroxypropanal	dehydr.	0.03 M aq. 20, 30, 100 °C [43, 24, 0.29 d]	5.2 d	(Pressman and Lucas, 1942)
BB. 3-hydroxybutanal	dehydr.	0.001 mM aq. 25 °C-pH 10 (2.3 d)		(Guthrie, 1974)
BB'. 3-hydroxybutanal	dealdol.	0.001 mM aq. 25 °C-pH 10 (29 d)		
CC. 3-OH-3-Me-butanal	dehydr.	0.01 mM aq. 25 °C-pH 10 (9.6 d)		(Guthrie and Dawson, 1983)
CC'. 3-OH-3-Me-butanal	dealdol.	0.01 mM aq. 25 °C-pH 10 (1.4 d)		

^a Abbreviations: decarboxylation (decarbox.), dehydration (dehydr.), isomerization (isomer.), unspecified C-1 transformation (C-1 transform.), fragmentation (fragm.), intramolecular reduction-oxidation (intramol. redox), dealdolization (dealdol.), hydrolytic deacylation (hydro. deacylation). The pathway relationships of reactions are unspecified.

^b Half-lives enclosed in parentheses were calculated from measured reaction rate constants (see Methods for all calculations).

^c Half-lives enclosed in brackets were estimated from product yields.

^d Half-lives at 50 °C were estimated by extrapolation using Arrhenius plots.