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For complex chelating agents, see also reference 77.

Note. This document was compiled by W.P. Jencks and has been added to by F.H. Westheimer

ACIDS

Compound	pK	Ref.			
AgOH	3.96	4	H ₃ PO ₂	2.0, 2.23*	28
Al(OH) ₃	11.2	28	H ₂ PO ₄ ⁻	7.21*	77
As(OH) ₃	9.22	28	HPO ₄ ⁻	12.32*	77
H ₃ AsO ₄	2.22, 7.0, 13.0	28	H ₃ PO ₃	2.0	28
H ₂ AsO ₄ ⁻	6.98*	77	H ₂ PO ₃ ⁻	6.58*	77
HAsO ₄ [*]	11.53*	77	H ₄ P ₂ O ₇	1.52*	77
As ₂ O ₃	0	4	H ₃ P ₂ O ₇ ⁻	2.36*	77
H ₃ AsO ₃	9.22*		H ₂ P ₂ O ₇ ⁼	6.60*	77
H ₃ BO ₃	9.23*	28	HP ₂ O ₇ ⁼	9.25*	77
H ₂ B ₄ O ₇	4.00	34	HReO ₄	-1.25	30
HB ₄ O ₇	9.00	34	HSCN	4.00	34
Be(OH) ₂	3.7	4	H ₂ SeO ₃	2.6, 8.3, 2.62*	28
HBr	-9.00	31	HSeO ₃	8.32	77
HOBr	8.7	28	H ₂ SeO ₄	Strong, 2.0	28
HOCl	7.53, 7.46	28, 33	HSeO ₄	2.00	34
HClO ₂	2.0	28	H ₃ SiO ₃	10.0	34
HClO ₃	-1.00	28	H ₂ SO ₃	1.9, 7.0, 1.76*	28, 77
HClO ₄ (70%)	-10.00	31	H ₂ SO ₄	-3.0, 1.9	28
CH ₃ SO ₃ H	-0.6	31	HSO ₃	7.21*	77
HCN	9.40	34	HSO ₄ ⁻	1.99*	77
H ₂ CO ₃	6.37, 6.35*, 3.58	34, 32	H ₂ S ₂ O ₄	1.9	29
HCO ₃	10.33*		H ₂ Se	3.89*	77
H ₂ CrO ₄	-0.98	30	HSe ⁻	11.00*	77
HCrO ₄	6.50*	2, 30	H ₂ S	7.00*	77
HOCN	3.92	34	HS ⁻	12.92*	77
HZ	3.17*, 0.59*	77	HSbO ₂	11.0	34
H ₂ GeO ₃	8.59, 12.72	34, 78	HTe	5.00	34
Ge(OH) ₄	8.68, 12.7	28	H ₂ Te	2.64, 11.0	34, 78
HI	-10.0	31	H ₂ TeO ₃	2.7, 8.0	28
HOI	11.0	28	Te(OH) ₆	6.2, 8.8	28
HIO ₃	0.8	28	H ₂ VO ₄ ⁻	8.95	30
H ₄ IO ₆ ⁻	6.00	34	HVO ₄ ⁼	14.4	30
H ₅ IO ₆	1.64, 1.55, 8.27	34, 28	H ₂ CrO ₄	0.74	77
HMnO ₄	-2.25	30	HOCN	3.73	77
NH ₃ OH*	5.98*		HSCN	0.85	77
NH ₄ [*]	9.24*	77	H ₃ PO ₂	1.07	77
HN ₃	4.72*	77	H ₃ PO ₄	2.12*	77
HNO ₂	3.29	28	H ₂ S ₂ O ₃	0.60*, 1.72*	77
HNO ₃	-1.3	28	H ₃ AuO ₃	13.3, 16.0	78
N ₂ H ₅ ⁺	7.99*	77	H ₃ GaO ₃	10.32, 11.7	78
H ₂ N ₂ O ₂	7.05	34	H ₅ IO ₆	3.29, 6.70, 15.0	78
H ₂ N ₂ O ₂ ⁻	11.0	34	(see above!)		
H ₂ OsO ₅	12.1	34	H ₄ V ₆ O ₁₇	1.96	78
H ₂ O	15.7	none	H ₂ NSO ₃ H	1.0	80
H ₃ O ⁺	-1.7	none			
Pb(OH) ₂	6.48 (10.92)	4 (78)			

* Indicates a thermodynamic value.

PHOSPHATES AND PHOSPHONATES

Phosphates

Compound	pK	Ref.
Phosphate	1.97, 6.82, 12.5	55
Glyceric acid 2-phosphate	3.6, 7.1	53
Enolpyruvic acid	3.5, 6.4	53
Methyl-	1.54, 6.31	55
Ethyl-	1.60, 6.62	55
n-Propyl-	1.88, 6.67	55
n-Butyl-	1.80, 6.84	55
Dimethyl-	1.29	55
Di-n-propyl	1.59	55
Di-n-butyl-	1.72	55
Glucose-3-	0.84, 5.67	56
Glucose-4-	0.84, 5.67	56
-glycero-	1.40, 6.44	54
-glycero-	1.37, 6.34	54
3-phosphoglyceric acid	1.42, 3.42	54
2-phosphoglyceric acid	1.42, 3.55, 7.1	
peroxymonophosphoric acid	4.05	69
diphosphoglyceric acid	7.40, 7.99	54
glyceraldehyde-	2.10, 6.75	54
dioxyacetone-	1.77, 6.45	54
hexose di-	1.52, 6.31	54
fructose-6-	0.97, 6.11	54
glucose-6-	0.94, 6.11	54
glucose-1-	1.10, 6.13	54
adenylic acid	3.8?, 6.2?	54
inosinic acid	2.4?, 6.4?	54
ADP	2 strong, 6.6	54
ATP	3 strong, 6.6	54
pyrophosphoric acid	0.9, 2.0, 6.6, 9.4	54
phosphopyruvic acid	3.5, 6.38	54
creatine phosphate	2.7, 4.5	54
arginine phosphate	2.8, 4.5, 9.6, 11.2	54
arginine	2.02, 9.0, 12.5	54
amino phosphate	(-0.9), 2.8, 8.2	54
trimetaphosphate	2.05	77

Phosphonates

H ₂ O ₃ P(CH ₂) ₄ PO ₃ H ₂	<2, 2.75, 7.54, 8.38	57
H ₂ O ₃ P(CH ₂) ₃ PO ₃ H ₂	<2, 2.65, 7.34, 8.35	57
H ₂ O ₃ PCH ₂ CH(CH ₃)PO ₃ H ₂	<2, 2.6, 7.00, 9.27	57
H ₂ O ₃ PCH ₂ PO ₃ H ₂	<2, 2.57, 6.87, 10.33	57
Methyl-	2.35	57
Ethyl-	2.43	57
n-propyl-	2.45	57
isopropyl-	2.55, 7.75	57
n-butyl-	2.59, 8.19	57
isobutyl-	2.70, 8.43	57
s-butyl-	2.74, 8.48	57
t-butyl-	2.79, 8.88	57
neopentyl-	2.84, 8.65	57
1,1 Dimethylpropyl-	2.88, 8.96	57
n-hexyl-	2.6, 7.9	57
n-dodecyl-	--, 8.25	57
CH ₃ (CH ₂) ₅ CH(COOH)-	1, --	57

CF ₃ -	1.16, 3.93	57
CCl ₃ -	1.63, 4.81	57
NH ₃ ⁺ CH ₂ -	2.35, 5.9	57
(-OOCCH ₂) ₂ NH ⁺ CH ₂ ⁻	--, 5.57	57
CHCl ₂ -	1.14, 5.61	57
CH ₂ Cl-	1.40, 6.30	57
CH ₂ Br-	1.14, 6.52	57
(-OOCCH ₂) ₂ NH ⁺ (CH ₂) ₂ -	--, 6.54	57
CH ₂ I-	1.30, 6.72	57
NH ₃ ⁺ CH ₂ CH ₂ -	2.45, 7.00	57
C ₆ H ₅ CH=CH-	2.00, 7.1	57
HOCH ₂ -	1.91, 7.15	57
C ₆ H ₅ NH ₂ ⁺ (CH ₂) ₃ -	2.1, --	57
C ₆ H ₅ NH(CH ₂) ₃ -	--, 7.17	57
Br(CH ₂) ₂ -	2.25, 7.3	57
CH ₃ (CH ₂) ₅ CH(COO ⁻)-	--, 7.5	57
C ₆ H ₅ CH ₂ -	2.3, 7.55	57
NH ₃ ⁺ (CH ₂) ₄ -	2.55, 7.55	57
NH ₃ ⁺ (CH ₂) ₅ -	2.6, 7.6	57
NH ₃ ⁺ (CH ₂) ₁₀ -	--, 8.00	57
-OOC(CH ₂) ₁₀ -	--, 8.25	57
(CH ₃) ₃ SiCH ₂ -	3.22, 8.70	57
C ₆ H ₅ CH ₂ -	3.3, 8.4	57
(C ₆ H ₅)SC-	3.85, 9.00	57

Arylphosphonic acids

2X-RC ₆ H ₃ PO ₃ H ₂			
X	R		
Cl	4-O ₂ N	1.12, 6.14	57
Br	5-O ₂ N	(a), 6.14	57
Cl	5-Cl	(a), 6.63	57
Cl	H	1.63, 6.98	57
Br	H	1.64, 7.00	57
Br	5-CH ₃	1.81, 7.15	57
Cl	4-NH ₂	--, 7.33	57
CH ₃ O	4-O ₂ N	1.53, 6.96	57
CH ₃ O	H	2.16, 7.77	57
CH ₃ O	4-O ₂ N	--, 8.22	57
HO	4-O ₂ N	1.22, 5.39	57
O ₂ N	H	1.45, 6.74	57
F	H	1.64, 6.80	57
I	H	1.74, 7.06	57
NH ₂ H	--, 7.29	57	
CH ₃ H	2.10, 7.68	57	
C ₆ H ₅	H	(a), 8.13	57
HOOC	H	1.71, 9.17	57

**These values were obtained in 50% ethanol.

(a) The compounds were not sufficiently soluble.

For graphical plots of a large number of substituted phosphorus compounds see 83.

triphosphate	8.90, 6.26, 2.30	77
tetrametaphosphate	2.74	77

fluorophosphate	0.55, 4.8	56
Phosphonates (Ref. 2)		
X	-H -H -NH₃⁺ -NH₃⁺	
X(CH ₂)PO ₃ H ₂	2.35 7.1 1.85 5.35	
X(CH ₂) ₂ PO ₃ H ₂	2.45 7.85 2.45 7.00	
X(CH ₂) ₄ PO ₃ H ₂		2.55 7.55
X(CH ₂) ₅ PO ₃ H ₂		2.6 7.65
X(CH ₂) ₆ PO ₂ H ₂	2.6 7.9	
X(CH ₂) ₁₀ PO ₂ H ₂		8.00
Phosphines in acetonitrile, see ref. 89.		

CARBOXYLIC ACIDS

Aliphatic

Compound	pK	Ref.
Acetoacetic	3.58	6
Acetopyruvic	2.61, 7.85 (enol)	6
Aconitic, trans-	2.80, 4.46	6
Betaine	1.84	6
Citric	3.09, 4.75, 5.41	6
Crotonic	4.69	6
Dihydroxyfumaric	1.14	6
Dethylenediamine-	2.00, 2.67	6
tetraacetic	6.16, 10.26	
Formic	3.77*	2
Fumaric	3.03, 4.54	6
Glyceric	3.55	6
Glycollic	3.82	6
Glyoxylic	3.32	6
Homogentistic	4.40	6
-keto- -methyl valeric	2.3	6
Lactic	3.86	6
Maleic	1.93, 6.58	6
Malic	3.40, 5.2	6
Oxaloacetic (trans-enol)	2.56	6
+ (cis-enol)	2.15, 4.06	6
Protocatechuic	4.48	6
Pyruvic	2.50	6
Tartaric +	2.99, 4.40	6
+ or -	2.89, 4.40	6
meso	3.22, 4.85	6
Vinylacetic	4.42	6

Acetic acids, substituted

H-	4.76*	20
O ₂ N-	1.68*	20
(CH ₃) ₃ N ⁺ -	1.83*	20
(CH ₃) ₂ NH ⁺ -	1.95*	20
CH ₃ NH ₂ ⁺ -	2.16*	20
NH ₃ ⁺ -	2.31*	20
CH ₃ SO ₂ -	2.36*	20
NC-	2.43*	20
C ₆ H ₅ SO ₂ -	2.44	20
HO ₂ C	2.83*	20
C ₆ H ₅ SO-	2.66	20
F-	2.66	20
Cl-	2.86*	20
Br-	2.86	20
Cl ₂ -	1.29	20
F ₂ -	1.24	20
Br ₃ -	0.66	20
Cl ₃ -	0.65	20
F ₃ -	0.23 (-0.26) (2)	20
HONC ₄	3.01	20
F ₃ C-	3.07*	20
N ₃ -	3.03	20
I-	3.12	20
C ₆ H ₅ O-	3.12	20
C ₂ H ₅ O ₂ C-	3.35	20
C ₆ H ₅ S-	3.52*	20
CH ₃ O-	3.53	20
NCS-	3.58	20
CH ₃ CO-	3.58*	20
C ₂ H ₅ O-	3.60	20
n-C ₃ H ₇ O	3.65	20
n-C ₄ H ₉ O	3.66	20
sec.-C ₄ H ₉ O-	3.67	20
HS-	3.67*	20
i-C ₃ H ₇ O-	3.69*	20
CH ₃ S-	3.72*	20
i-C ₃ H ₇ S-	3.72*	20
C ₆ H ₅ CH ₂ S-	3.73*	20
C ₂ H ₅ S-	3.74*	20
n-C ₃ H ₇ S-	3.77*	20
n-C ₄ H ₉ S-	3.81*	20
HO-	3.83*	20
-O ₃ S-	4.05	20
(C ₆ H ₅) ₃ CS-	4.30*	20
C ₆ H ₅ -	4.31*	20
CH ₂ -CH-	4.35*	20

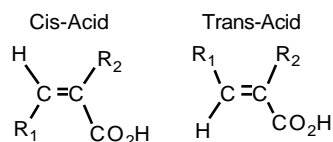
* Indicates thermodynamic values.

Unsaturated acids (25°)

Compound	pK	ref.
trans-CH ₃ -CH=CHCO ₂ H	4.69*	20
cis-CH ₃ -CH=CHCO ₂ H	4.44*	2
C ₆ H ₅ -CH ₂ CH ₂ CO ₂ H	4.66*	2
trans-C ₆ H ₅ -CH=CHCO ₂ H	4.44*	2
m-CH ₃ OC ₆ H ₄ CH ₂ CH ₂ CO ₂ H	4.65*	2
m-CH ₃ OC ₆ H ₄ CH=CHCO ₂ H	4.38*	2
m-ClC ₆ H ₄ CH ₂ CH ₂ CO ₂ H	4.58*	2

Compound	pK	ref.
H-CH ₂ CH ₂ CO ₂ H	4.88*	2
H-CH=CHCO ₂ H	4.25*	2
C ₆ H ₅ CH ₂ CH ₂ CO ₂ H	4.66*	2
C ₆ H ₅ CH=CHCO ₂ H**	4.44*	2
C ₆ H ₅ CH ₂ CH ₂ CO ₂ H	4.66*	2
C ₆ H ₅ CH=CHCO ₂ H**	4.44	2
m-ClC ₆ H ₄ CH=CHCO ₂ H**	4.29*	2

Unsaturated acids, Cis- and Trans-



R ₁	R ₂	cis-acid	trans-acid	Ref.
H-	H-	4.25*	4.25*	2
CH ₃ -	H-	4.44*	4.69*	2
Cl-	H-	3.32	3.65	2
C ₆ H ₅ -	H-	3.88*	4.44*	2
ClC ₆ H ₄	H-	3.91	4.41	2
6-BrC ₆ H ₄	H-	4.02	4.41	2
CH ₃ -	CH ₃ -	4.30	5.02	2
C ₆ H ₅ -	H-	5.26***	5.58***	2
2,4,6-(CH ₃) ₃ C ₆ H ₂ -	H-	6.12***	5.70***	2
C ₆ H ₅ -	CH ₃ -	4.98***	5.98***	2

Dicarboxylic acids, unsaturated*

Maleic	1.92, 6.23	2
Citraconic (Dimethylmaleic acid)	2.29, 6.15	2
Acetylenedicarboxylic	1.73, 4.40	2
1-tetrahydrophthalic	3.01, 5.34	2
Bromomaleic	1.45, 4.62	2
Bromofumaric	1.46, 3.57	2
Chlorofumaric	1.78, 3.81	2
Fumaric	3.02, 4.38	2
Mesaconic (Dimethylfumaric acid)	3.09, 4.75	2
Phthalic	2.95, 5.41	2
Itaconic (1-Propene-2-3-dicarboxylic acid)	3.85, 5.45	2
Chloromaleic	1.72, 3.86	2

Alicyclic Dicarboxylic acids

cis-Caronic(1,1-dimethylcyclopropane-2,3-dicarboxylic acid	2.34*, 8.31*	2
1,2-trans-cyclopropanedicarboxylic	3.65*, 5.13*	2
trans-caronic	3.82*, 5.32*	2
1,2-cis-cyclopropane-dicarboxylic	3.33*, 6.47*	2

**trans

***in 40% acetone

*thermodynamic

Aliphatic

Alicyclic Dicarboxylic acids

Compound	pK	Ref	Compound	pK	Ref
1,2-trans-Cyclopropane-dicarboxylic	3.65, 5.13	2	cis-Ethyleneoxide-dicarboxylic	1.94, 3.92	2
trans-Ethyleneoxide-dicarboxylic	1.93, 3.25	2	1,3-cis-Cyclobutane-dicarboxylic	4.03, 5.31	2
1,3-trans-Cyclobutanedi-carboxylic	3.81, 5.28	2	1,2-cis-Cyclopentane-dicarboxylic	4.37, 6.51	2
1,2-trans-Cyclopentane-dicarboxylic	3.89, 5.91	2	1,3-cis-Cyclopentane dicarboxylic	4.23, 5.53	2
1,3-trans-Cyclopentane-dicarboxylic	4.40, 5.45	2	1,2-cis-Cyclohexane-dicarboxylic	4.34, 6.76	2
1,2-trans-Cyclohexane-dicarboxylic	4.18, 5.93	2	1,3 -cis-Cyclohexane-dicarboxylic	4.10, 5.46	2
1,3-trans-Cyclohexane-dicarboxylic	4.31, 5.73	2	1,4-cis-Cyclohexane di-carboxylic	4.44, 5.79	2
1,4-trans-Cyclohexane-dicarboxylic	4.18, 5.42	2			

Dicarboxylic acids*

oxalic	1.23, 4.19	2	Succinic	4.19, 5.48	2
Malonic	2.83, 5.69	2	O-O'-Dimethyl-(high melting)	3.77, 5.94	2
Methyl-	3.05, 5.76	2	O-O'-Dimethyl-(low melting)	3.94, 6.20	2
Ethyl-	2.99, 5.83	2	O,O'-Diethyl-(high melting)	3.63, 6.46	2
n-propyl	3.00, 5.84	2	O,O'-Diethyl-(low melting)	3.51, 6.60	2
i-propyl-	2.94, 5.88	2	Tetramethyl-	3.50, 7.28	2
Dimethyl-	3.17, 6.06	2	Adipic	4.42, 5.41	2
Methylethyl-	2.86, 6.41	2	Pimelic	4.48, 5.42	2
Diethyl-	2.21, 7.29	2	Suberic	4.52, 5.40	2
Ethyl-n-propyl-	2.15, 7.43	2	Azelaic	4.55, 5.41	2
Di-n-propyl-	2.07, 7.51	2	DL-1:2-Dichlorosuccinic	1.68, 3.18	20
Glutaric	4.34, 5.42	2	meso-1:2-Dichlorosuccinic	1.74, 3.24	20
B-Methyl	4.25, 6.22	2	DL-1:2-Dibromosuccinic	1.48, ----	20
B-Ethyl	4.29, 6.33	2	meso-1:2-Dibromosuccinic	1.42, 2.97	20
B-n-Propyl	4.31, 6.39	2	DL-1:2-Dimethylsuccinic	3.93, 6.00	20
B,B-Dimethyl-	3.70, 6.29	2	meso-1:2-Dimethylsuccinic	3.77, 5.36	20
B,B-Methylethyl-	3.62, 6.70	2			
B,B-Diethyl-	3.62, 7.12	2			
B,B-Di-n-propyl	3.69, 7.31	2			
D-Tartaric	3.03, 4.45	20			
DL-Tartaric	3.03, ----	20			
meso-Tartaric	3.29, 4.92	20			

*All are thermodynamic values

Aliphatic

Bicyclo[2.2.2]octane-1-carboxylic acids, 4-substituted

H-	6.75	2	HO-	6.33	2
C ₂ H ₅ O ₂ C-	6.31	2	Br-	6.08	2
NC-	5.90	2	Lysergic acid, etc.		
			ergometrine	6.8, --	2
			Dihydroergometrine	7.4, --	2
			-dihydrolysergol	8.2, --	2

Lysergic acid	7.8, 3.3	2
-dihydrolysergic	8.3, 3.6	2
ergometrinine	7.3, --	2
-dihydrolysergol	8.3, --	2
6-methylergoline	8.85, --	2
isolysergic acid	8.4, 3.4	2
-dihydrolysergic	8.6, 3.6	2

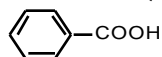
Hydroxycyclohexanecarboxylic acids

Cyclohexanecarboxylic	4.90	2
cis-1,2	4.80	2
cis-1,3	4.60	2
cis-1,4	4.84	2
trans-1,2	4.68	2
trans-1,3	4.82	2
trans-1,4	4.68	2

Aromatic

benzene-CO ₃ H	4.20*	2
Anthracene-1-COOH	3.69	2
Anthracene-9-COOH	3.65	2
naphthalene-2-COOH	4.17	2
Naphthalene-1-COOH	3.69	2

Substituted benzoic acids (ref. 2)



Benzoic acid	o	m	p
H-	4.20*	4.21*	
O ₂ N-	2.17*	3.45*	3.44
CH ₃ CO-			
CH ₃ SO ₂ -		3.64*	3.52*
CH ₃ S-			
HS-			
Br-	2.85*	3.81*	4.00*
F-	3.27*	3.87*	4.14*
CH ₃ O-	4.09*	4.09*	4.47*
n-C ₃ H ₇ O-	4.24*	4.20*	4.46*
n-C ₄ H ₉ O-		4.25*	4.53*

Benzene Polycarboxylic acids Ref. 2

Acid	Position of carboxyl	pK ^I	pK ^{II}	pK ^{III}	pK ^{IV}	pK ^V	pK ^{VI}
Benzoic	1	4.17*					
Phthalic	1,2	2.98*	5.28*				
Isophthalic	1,3	3.46*	4.46*				
Terephthalic	1,4	3.51*	4.82*				
Hemimellitic	1,2,3	2.80*	4.20*	5.87*			
Trimellitic	1,2,4	2.52*	3.84*	5.20*			

C ₆ H ₅ O-	3.53*	3.95*	4.52*
CH ₃ -	3.91*	4.24*	4.34*
(CH ₃) ₂ CH-			4.35*
(CH ₃) ₃ N ⁺ -	1.37	3.45	3.43
NC-		3.60*	3.55*
HO ₂ C*	2.95*	3.54	3.51
F ₃ C-		3.79	
HO-	2.98*	4.08*	4.58*
I-	2.85*	3.86*	
Cl-	2.94*	3.83*	3.99*
(CH ₃) ₃ Si-		4.24*	4.27*
C ₂ H ₅ O-	4.21*	4.17*	4.45*
i-C ₃ H ₇ O-	4.24*	4.15*	4.68*
n-C ₅ H ₁₁ O-			4.55*
C ₆ H ₅ -	3.46*		
CH ₃ CH ₂ -	3.77		4.35*
(CH ₃) ₃ C-	3.46	4.28	4.40*
-HO ₃ P-	3.78	4.03	3.95
-O ₃ S-		4.15	4.11
H ₂ N-	4.98	4.79	4.92
(CH ₃) ₂ N-	8.42	5.10	5.03
-HO ₃ As-			4.22
-O ₂ C-	5.41**	4.60	4.82
CH ₃ NH-	5.3	5.10	5.04

*thermodynamic

for complex chelating agents, see also ref. 84.
see also page 9a for more carboxylic acids.

Ortho-substituted benzoic acids

Benzoic acid	pK	Ref.
2-CH ₃ -	3.91**	2
2-t-C ₄ H ₉ -	3.46	2
2,6-(CH ₃) ₂ -	3.21	2
2,3,4,6-(CH ₃) ₄ -	4.00	2
2,3,5,6-(CH ₃) ₄ -	3.52	2
2-C ₂ H ₅ -	3.77	2
2-C ₆ H ₅ -	3.46**	2
2,4,6-(CH ₃) ₃ -	3.43	2
2,3,4,5-(CH ₃) ₄ -	4.22	2

Trimesic	1,3,5	3.12*	3.89*	4.70*		
Mellophanic	1,2,3,4	2.06*	3.25*	4.73*	6.21*	
Prehnitic	1,2,3,5	2.38*	3.51*	4.44*	5.81*	
Pyromellitic	1,2,4,5	1.92*	2.87*	4.49*	5.63*	
Benzenepentacarboxylic	1,2,3,4,5	1.80*	2.73*	3.97*	5.25*	6.46*
Mellitic	1,2,3,4,5,6	1.40*	2.19*	3.31*	4.78*	5.89* 6.96*
<i>*ionic strength 0.03</i>		2-Methoxyethyliminodiacetic				
<i>**thermodynamic</i>		2-Methylthioethyliminodiacetic				
		oxalic acid*				
		N-n-propylaminoacetic				
		N-2-sulfoethyliminodiacetic				
		-Bromobutyric acid				
		N-(carbamoylmethyl)-imino-diacetic acid				
		Cyanomethyliminodiacetic				
		, -diaminopropionic acid				
		Diethylaminoacetic				
		Dimethylaminoacetic				
		N-ethylaminoacetic				
		Gluconic*				
		-hydroxybutyric				
		-hydroxypropionic				
		Iminodiacetic*				
		-iodopropionic*				
		N-isopropylaminoacetic				
		-mercaptopropionic				
		N-methylaminoacetic				
		Nitrilotriacetic				
		2-Phosphonoethyliminodiacetic				
Carboxylic Acids	Ref. 77					
Aminomalonic acid*	3.32, 9.83					
N-Butylaminoacetic acid	2.29, 10.07					
2-carboxyethyliminodiacetic acid	2.06, 3.69, 9.66					
-carboxymethylaminopropionic	3.61, 9.46					
, -diaminobutyric	1.85, 8.24, 10.44					
Di-(carboxymethyl)-aminomethyl phosphonic acid	2.00, 2.25, 5.57, 10.76					
, -dimercaptosuccinic	2.40, 3.46, 9.44, 11.82					
Ethylenediamine-N,N-diacetic	5.58, 11.05					
-hydroxybutyric	3.65					
N-2-hydroxyethyliminodiacetic	2.2, 8.73					
3-hydroxypropyliminodiacetic	2.06, 9.24					
Iminodipropionic	4.11, 9.61					
Isobutyric*	4.86					
Mandelic acid	3.41					
2-Mercaptoethyliminodiacetic	-2.14, 8.17, 10.79					
Methyliminodiacetic	2.81, 10.18					

**Thermodynamic*

PHENOLS

Compound	pK		Ref.	Compound	pK		Ref.
Chromotropic acid	5.36, 15.6		6	Resorcinol	--, 9.15 (30°)		50
o-Methoxyphenol	--, 9.93		50	p-Methoxyphenol	--, 10.16		50
o-Hydroxybenzaldehyde	7.95		50	3-Hydroxyanthranilic acid	10.09, 5.20		51
2-Amino-4,5 dimethylphenol hydrochloride	10.4 5.28		51	2-Aminophenol hydrochloride	9.99, 4.86		51
4,5-dihydroxybenzene-1,3 disulphonic acid	7.66 12.6e						
Kojic acid	9.40		77				
Phenol	o	m	p	Phenol	o	m	p
H-	9.95*	9.94*		O ₂ N-	7.23*	8.35*	7.14*
(CH ₃) ₃ N ⁺ -	7.42	8	8	OCH-	6.79	8.00	7.66
CH ₃ SO ₂ -		9.33	7.83	NC-		8.61**	7.95
CH ₃ CO-		9.19	8.05	CH ₃ O ₂ C-			8.47*
C ₂ H ₅ O ₂ C-			8.50*	n-C ₄ H ₉ O ₂ C-			8.47*
C ₃ H ₅ CH ₂ O ₂ C-			8.41*	I-		9.17*	
Br-	8.42*	9.11*	9.34*	Cl-	8.48*	9.02*	9.38*
F-	8.81*	9.28*	9.95*	CH ₃ S-		9.53	9.53
HO-	9.48	9.44	9.96	HOCH ₂ -	9.92*	9.83*	9.82*
CH ₃ -	10.28*	10.08	10.19*	C ₂ H ₅ -	10.2	9.9	10.0
CH ₃ O-	9.93	9.65	10.20	H ₂ N-	9.71	9.87	10.30
-O ₂ C-		9.94*	9.39*	-O ₃ S-		9.29	9.03
--O ₃ P-		10.2	9.9	--O ₃ As			8.37
C ₆ H ₅ -	9.93	9.59	9.51	NO-			6.35**
2-Chloro-4-Nitro-		5.42	79				
2-Nitro-4-Chloro-		6.46	79				

* Thermodynamic

**Reference 52

ALCOHOLS and other OXYGEN ACIDS

Alcohols

Compound	pK	Ref.	Compound	pK	Ref.			
Choline	13.9	6	C ₃ F ₇ •CH(C ₂ F ₅)•OH	10.48	65			
Chloral hydrate	9.66, 11.0	61	(C ₃ F ₇) ₂ CH•OH	10.52	65			
Trifluoroethanol	12.5		62 Carbonium ions					
CF ₃ CH ₂ OH	11.4, 12.43	63						
CF ₃ CH(OH)CH ₃	11.8	63	Triphenylmethanols in	H ₂ SO ₄	HC1O ₄	HNO ₃	ref	
CF ₃ CH ₂ (CH ₃) ₃ OH	12.43	10	4,4,4-Trimethoxy	.82.	.82	.80	66	
C ₃ F ₇ CH ₂ OH	11.4**	63	4,4'-Dimethoxy	-1.24	-1.14	-1.11	66	
(C ₃ F ₇) ₂ CHOH	10.6**	63	4-Methoxy	-3.40	-3.59	-3.41	66	
HCCCH ₂ OH	13.55	64	4-Methyl	-5.41	-5.67		66	
C(CH ₂ OH) ₄	14.1	64	4-Trideuteriomethyl-	5.43	5.67		66	
HOCH ₂ CHOHCH ₂ OH	4.4	64	3,3',3"-Trimethyl-	6.35	-5.95		66	
HOCH ₂ CH ₂ OH	14.77	64	Unsubstituted triphenyl-					
CH ₃ CCH ₂ OH	14.82	64	methanol-	6.63	-6.89	6.60	66	
CH ₃ OH	15.54		64 4,4',4;-Trichloro-			7.74-	8.01	66
CH ₂ =CHCH ₂ OH	15.52		64 4-Nitro-			9.15-	9.76	66
H ₂ O	15.74	64	CCl ₃ CH ₂ OH	11.8***				
CH ₃ CH ₂ OH	16	64	CF ₃ CH ₂ OH	11.3***				
Substituent effects for ionization of RCH ₂ OH								
R								
CCl-3	12.24,11.80	64,65						
CF3-	12.37	64						
CHF ₂ CH ₂ -	12.74	64	Hydroxamic acids					
CHCl ₂ -	12.89	64	Furo-	8.45			72	
CH ₃ EC-	13.55	64	Glycine	7.40			72	
H ₂ Cl-	14.31	64	Hippuro-	8.80			72	
CH ₃ CCH ₂ -	14.8	64	isoNicotin	7.85			72	
HOCH ₂	15.1		64 p-Methylbenz-		8.90		72	
H-	15.5	64	Nicotin-		8.30		72	
CH ₂ =CH-	15.5	64	Nicotin-methiodide	6.46			72	
CH ₃ -(extrap)	(15.9)	64	m-Nitrobenz-	8.07			72	
CF ₃ C(CH ₃) ₂ OH	11.6	64	Picolin	8.50			72	
HOCH ₂ CF ₂ CH ₂ OH	11	64	Pyrimidine-2-carbox-	7.88			72	
Primary alcohols=R•CH ₂ •OH and			Salicyl-	7.43			72	
Secondary alcohols in 50% alcohol			Tropo-		9.09		72	
C ₂ F ₅	11.35	65						
C ₄ F ₉	11.35	65						
C ₅ F ₁₁	11.37	65						
C ₇ F ₁₅	11.35	65	Other oxygen acids					
CHF ₂	12.00	65	Trimethylamine-n-oxide	4.6			18	
CF ₂ Cl	11.63	65	Dimethylglyoxime		12.84		77	
CHF ₂ CF ₂	11.34	65	(50% dioxane)					
CHF ₂ •(CF ₂) ₂	11.35	65	O-methyl ether	12.92			77	
CF ₃ •CH ₂	12.7	65	Tropolone	12a			77	
CF ₃ •(CH ₂) ₂	12.9	65	-Bromotropolone	6.95 ^a			77	
CF ₃ •CHMe•OH	11.28	65	Acetald hydrate	13.48			91	
C ₃ F ₇ •CHMe•OH	11.38	65	Formald hydrate	13.29			91	
C ₃ F ₇ CH ₂ Et•OH	11.37	65						
C ₃ F ₇ CHPr•OH	11.37	65						
C ₃ F ₇ •CH(CF ₃)•OH	10.46	65	^a 50% dioxane					
			***50 aqueous ethanol					

OTHER OXYGEN ACIDS

Compound	pK	Ref.
Pyridine oxides		
4-Aminopyridine 1-oxide	3.69	67
4-Dimethylaminopyridine 1-oxide	3.88	67
4-Dimethylaminopyridine 1-oxide	3.88	67
4-Dimethylamino-1-methoxypyridinium perchlorate	>11	67
2-Methylaminopyridine 1-oxide	2.61	67
2-Amino-1-methoxypyridinium perchlorate	12.4	67
4-Hydroxypyridine 1-oxide	2.45	67
4-Methoxypyridine 1-oxide	2.05	67
1-Methoxypyridi-4-one	2.57	67
2-Hydroxypyridine 1-oxide	-0.8	67
2-Ethoxypyridine 1-oxide	1.18	67
1-Methoxypyrid-2-one	-1.3	
4-Methylaminopyridine 1-oxide	3.85	67
4-Amino-1-methoxypyridinium perchlorate	>11	67
2-Aminopyridine 1-oxide	2.67	67
2-Dimethylaminopyridine 1-oxide	2.27	67
2-Methylamino-1-methoxypyridinium toluene-p-sulphonate	>11	67
4-Benzyloxypyridine 1-oxide	1.99	67
1-Benzyloxypyrid-4-one	2.58	67
2-Methoxypyridine 1-oxide	1.23	67
1-Benzyloxypyrid-2-one	-1.7	67

Pyridine 1-oxides

R	pK	Ref.
4-CH ₃	1.29	47
3-CH ₃	1.08	47
3,4-(CH) ₄	1.01	47
3-COOC ₄ H ₉	0.03	47
4-NO ₂	-1.7	47
3-NH ₂	1.47	47
H	0.79	47
3-COOH	0.09	47
4-COOH	-0.48	47

Peroxides ROOH (Ref. 70)

H	CH ₃	C ₂ H ₅	iso-C ₃ H ₇	tert-C ₄ H ₉	iso-C ₄ H ₉
11.6	11.5	11.8	12.1	12.8	12.8

Oximes

benzoquinoline mon-	ref. 93
3-pyridine-1,2-ethanedione-2-oxime	6.25
methiodide	7.20

Hydroxamic acids

Aceto-	9.40	68
n-Butyro-	9.48	68
n-Butyro-	9.00	68
p-Methoxybenzo-	9.19	68
N-Hydroxyphthalimide	7.00, 6.10	71, 72
Salicylo	7.32	68
Benzo-	8.88	68
p-Chlorobenzo-	9.59	68
-Naphtho-	~7.7	68
Propiono-	9.46	68

Oximes

Benzophenone oxime	11.3	18
Diethyl ketoxime	12.6	18
Isonitrosoacetylacetone (INAA)	7.4	76
5-Methyl-1,2,3-cyclohexanetrione-1,3-dioxime	8.3	76
Acetophenone oxime	11.48	18
Acetoxime	11.42	18
Isonitrosoacetone (INA)	8.3	76
Salicyclaldoxime (SA)	9.2	76
1,2,3-Cyclohexanetrionetrioime	8.0	76
5-Methyl-1,2,3-cyclohexane-trionetrioime	8.0	76

Oxygen acids

sulfinic acids

p-Toluene-	1.99	73
p-Chlorobenzene-	73	
p-Nitrobenzene-	73	
p-Bromobenzene-	1.89	73
m-Nitrobenzene-	1.88	73
Benzene-	1.84, 2.16	73

Peroxyacids

Peroxymonosulfuric	9.4	69
Acetic	8.2	70
n-Butyric	8.2	70
Formic	7.1	70
Propionic	8.1	70
peroxydiphosphoric	5.18, 7.8	85
peroxymonophosphoric	4.85	90

Pyridine-2-aldoxime heptiodide	8.00
Pyridine-4-aldoxime methiodide	8.50
Pyridine-4-aldoxime pentiodide	8.50

4-Pyridine-1,2-ethanedione-2-oxime methiodide	7.1
Pyridine-2-aldoxime methiodide	8.0
Phenylglyoxald-	8.3
Pyridine-4-aldoxime dodecioidide	8.5
Pyridine-3-alkoxime methiodide	9.2

Hydroxamic acids ref. 93

D-Lysine-	7.93
N-phenylnicotino-	8.00
Chloroaceto-	8.40
Formo-	8.65
p-Chlorophenoxyaceto-	8.75
p-Hydroxybenzo-	8.93
p-Methoxybenzo-	9.00
N-Phenylbenzo-	9.15
o-Aminobenzo-	9.17
L-Tyrosine	9.20
L-Lysine	7.9
p-Nitrobenzo-	8.0
p-Aminobenzo-	9.3
L-Lacti-	9.3
Propiono-	9.4
Phthalo-	9.4
Indole-3-aceto-	9.5
Cyclohexano-	9.7
Hexano-	9.7

Amino Acids

Compound	pK -COOH	Ref. -NH ₃
Alanine	2.35 9.69	6
-Aminobutyric acid	2.55 9.60	
-Aminoisobutyric	2.36 10.21	6
Argininosuccinic	>12, 1.62 9.58	6
	2.70, 4.26	
Aspartic acid	2.09, 3.86 9.82	6
Canaline	10.3, 9.20 11.6 (?)	6
Creatinine	4.84 9.2	6
Cystine	1.65 7.85	6
	2.26 9.85	6
Diidotyrosine	6.48, 2.12 7.82	6
Glutamic acid	2.19, 4.25 9.67	6
Glycine	2.34 9.6	6
Histidine	6.0, 1.82	9.17
	6	
Hydroxylsine	2.13 8.62	6
	9.67	
Isoleucine	2.36 9.68	6
Lysine	2.18 8.95	6
	10.53	
O-Methyl tyrosine	9.27	21

O-Methyltyrosine ethyl ester	7.31	22
octopine	13, 1.36	8.77
	6	
	2.40	
Phenylalanine	1.83 9.13	6
2-Pyrrolidoone-5-carboxylic acid (glucamic acid)	3.32	
Serine	2.21 9.15	6
Threonine	2.63 10.43	6
N-Trimethyl tyrosine	9.75	21
Tyrosine	10.07, 2.20 9.11	
Urocanic acid	5.8 3.5	
Valine	2.32 9.62	6
-Alanine	3.60 10.19	6
-Aminobutyric acid	4.23 10.43	6
Arginine	12.48 2.17 9.04	6
Asparagine	2.02 8.8	6
Azaserine	8.55	6
Canavanine	7.40, 9.25 11.50 (?)	6
Creatine	2.67 11.02	6
Cysteine	10.78 1.71 8.33	6
3,4-Dihydroxyphenylalanine		
	9.88, 2.36 8.68	6
	11.68	
Glutamine	2.17 9.13	6
Histamine	5.0 9.7	6
-Hydroxyglutamic acid	2.09 9.20	6
	4.18	
Hydroxyproline	1.92 9.73	6
Leucine	2.36 9.60	6
Methionine	2.28 9.21	
1-Methylhistidine	6.48, 1.69 8.85	6
Norleucine	2.39 9.76	6
Norvaline	2.36 9.76	6
Ornithine	1.71 8.69	6
	10.76	
Proline	1.99 10.60	6
Sarcosine	2.23 10.01	6
Taurine	1.5 8.74	6
Thiolhistidine	<1.5, 11.4	
	1.84 8.47	6
Tryptophan	2.38 9.39	6
Tyrosine ethyl ester	7.33 9.80	22
Peptides		
Anserine	7.0 2.65 9.5	6
Carnosine	6.83 -- 9.51	6
Cystinyldiglycine	3.12 6.36	6
	3.12 6.95	
Glycylglycine	3.06 8.13	
Gly-gly-gly	3.26 7.91	23
Glycylproline	2.84 8.55	6
Aspartyl histi-	2.45 7.98	

dine	6.82	3.02		Gly-gly-gly-gly	3.05	7.75	23
Diglycylcystine	2.71	7.94	6	Lysyl-lysine (L,L)	3.01	7.53	6
Glutathione 9.12	2.12	8.66	6		10.05	11.01	
	3.53						

Compound	-COOH	α -NH ₂	ϵ -NH ₂	ϵ -NH ₂	ϵ -NH ₂	Ref.
Gly•Ala (L) or (D)	3.17	8.23				27
Ala•Gly (L) or (D)	3.16	8.24				27
Gly•Ala•Ala (LL)	3.38	8.10				27
Gly•Ala•Ala (LD)	3.30	8.17				27
Ala•Ala•OH (DD)	3.30	8.14				27
Ala•Ala•OH (LD)	3.12	8.30				27
H•Ala•Ala•Ala•OH (3L)	3.39	8.03				27
H•Ala•Ala•Ala•OH (LLD)	3.37	8.05				27
H•Ala-Ala-Ala•OH (LDL)	3.31	8.13				27
H•Ala-Ala-Ala•OH (DLL)	3.37	8.06				27
H-Ala-Ala-Ala•OH (3D)	3.39	8.06				27
H•Ala-Ala-Ala-Ala•OH (4L)	3.42	7.94				27
H•Ala-Ala-Ala-Ala•OH (LLDL)	3.24	7.93				27
H•Ala-Ala-Ala-Ala•OH (LDLL)	3.22	7.99				27
H•Ala-Ala-Ala-Ala•OH (DLLL)	3.42	7.99				27
H•Lys-Ala•OH (LL)	3.22	7.62	10.70			27
H•Lys-Ala•OH (LD)	3.00	7.74	10.63			27
H•Ala-Lys-Ala•OH (3L)	3.15	7.65	10.30			27
H•Ala-Lys-Ala•OH (LDL)	3.33	7.97	10.36			27
H•Ala-Lys-Ala•OH (LLD)	3.29	7.84	10.49			27
H•Ala-Lys-Ala-Ala•OH (4L)	3.58	8.01	10.58			27
H•Ala-Lys-Ala•OH (LDLL)	3.32	8.01	10.37			27
H•Ala-Lys-Ala-Ala-Ala•OH (5L)	3.53	7.75	10.35			27
H•Ala-Lys-Ala-Ala-Ala•OH (LDLLL)	3.30	7.85	10.29			27
H•Lys-Lys•OH (LL)	3.01	7.53	10.05	11.01		27
H•Lys-Lys•OH (LD)	2.85	7.53	9.92	10.98		27
H•Lys-Lys•OH (3L)	3.08	7.34	9.80	10.54	11.32	27
H•Lys-Lys-Lys•OH (LDL)	2.91	7.29	9.79	10.54	11.42	27
H•Lys-Lys-Lys•OH (LDD)	2.94	7.14	9.60	10.38	11.09	27
Compound	pK		ref.			
Glutathione	3.59, 8.75, 9.65		77			
Glycylserine	8.23		77			
Glycylleucine	8.13		77			
Leucylglycine	7.96		77			
Glycylisoleucine	7.96		77			
Leucylglycylglycine	7.66		77			
Glycylphenylalanine	8.28		77			
Glycyltyrosine	8.22		77			
Benzylglutamic acid	3.49, 4.99		77			
Glycyltryptophane	8.04		77			
Glutathione, oxidized	3.15, 4.03, 8.57, 9.54		77			
Alanylalanine (LL)	3.30	8.14	92			
Alanylalanine (LD)	3.12	8.30	92			
Lysylalanine (LL)	3.22	7.62	10.70	92		
Lysylalanine (LD)	3.00	7.74	10.63	92		
Leucyltyrosine (LL)	3.46	7.84	10.09	92		
Leucyltyrosine (DL)	3.12	8.38	10.35	92		

Lysylllysine (LD)		2.85	7.53	9.92	92		
NITROGEN COMPOUNDS							
Aliphatic Amines		pK	ref.				
Ammonia		9.21	1	n-Propyl-	10.53	1	
Primary Amines				Trimethylsilylmethyl-	10.96	1	
-Alanine ester		9.13	1	CH ₃ ONH ₂	4.60	12	
Allylamine-		9.69	2	Allyl-	9.49	1	
Benzyl		9.34	1	-Amino-n-butyric acid ester	9.71	1	
n-Butyl-		10.59	1	sec-Butyl-	10.56	1	
t-Butyl-		10.55	1	Cyclohexyl-	10.64	1	
Cyclohexylmethyl-		10.49	1	-difluoroethyl-	7.52	1	
Ethanol-		9.50	1	Ethyl	10.63	1	
Ethylenedi-		9.98, 7.52	1, 77	Glycine ester	7.75	1	
Hydrazine		8.10	1	Hydroxyl-	5.97	1	
Isopropyl-		10.63	1	Methoxy-	4.60	1	
Methyl-		10.62	1	neo-Pentyl-	10.21	1	
Phenylamyl-		10.49	2	-Phenylbutyl	10.40	2	
-Phenylethyl-		9.83	1	-Phenylpropyl-	10.20	1	
				Triethylenedi-	8.8*	?	
X	XNH₃⁺	XCH₂NH₃⁺	X(CH₂)₂NH₃⁺	X(CH₂)₃NH₃⁺	X(CH₂)₄NH₃⁺	X(CH₂)₅NH₃⁺	ref.
H-	9.25*	10.64*	10.67*	10.58*	10.61*	10.63*	2
HF ₂ C-		7.52					
RO ₂ C-		7.75	9.13	9.71	10.15*	10.37	2
HO-	5.96*		9.50*				
C ₆ H ₅ -	4.58*	9.37*	9.83*	10.20*	10.39*	10.49*	2
H ₂ N-	8.12*		9.98*	10.65*	10.84*	11.05*	2
H ₂ C=CH-		9.69					
CH ₃ -	10.64*	10.67*	10.58*	10.61*	10.63*	10.64*	2
X	-H	-NH₃⁺	-CO₂⁻	-SO₃⁻	-PO₃⁻		2
X-NH ₃ ⁺	9.25*	-.88		1	10.25		
X(CH ₂) ₂ NH ₃ ⁺	10.64			9.77	5.75	10.8	
X(CH ₂) ₂ NH ₃ ⁺	10.67			10.19	9.20	10.8	
X(CH ₂) ₄ NH ₃ ⁺	10.61	9.31		10.77	10.65	10.9	
X(CH ₂) ₅ NH ₃ ⁺	10.63	9.74		10.75	10.95	11.0	
X(CH ₂) ₈ NH ₃ ⁺	10.65	10.10					
X(CH ₂) ₁₀ NH ₃ ⁺	10.64				11.35	11.25	
X(CH ₂) ₃ NH ₃ ⁺	10.58	8.59		10.43	10.05		
Secondary amines				Di-n-butyl-	11.25	1	
Dimethyl-		10.64	1	Diisobutyl-	10.50	1	
Di-n-propyl-		11.00	1	-Ethylpyrroline	7.43	2	
Diisopropyl-		11.05	1	-Benzylpyrroline-	7.08	2	
t-Butylcyclohexyl-		11.23	1	2-Methylpiperidine	10.99	2	
-Cyclohexylpyrroline		7.95	2	-Cyclohexylpyrrolidine	10.80	2	
-(p-Tolyl)pyrroline		7.59	2	-(p-Tolyl)pyrrolidine	10.01	2	
-Ethylpyrrolidine		10.43	2	N,O-dimethylhydroxylamine	4.75	12	
-Benzylpyrrolidine		10.36	2	Acetanilide	+0.61	4	
N-methylhydroxylamine		5.96	12	<i>*thermodynamic value</i>			
Diethyl-		10.98	1				

Aliphatic Amines

1,2-Iminoethane	7.98	7
cis-2,3-Iminobutane	8.72	7
1,2-Imino-2-methylpropane	8.61	7
1,2-Iminobutane	8.29	7
trans-2,3-Iminobutane	8.69	7

Secondary Amines

Allylmethyl-	10.11	1
Benzylethyl-	9.68	1
Morpholine	8.36	1
N-Benzoylpiperazine	7.78	1
Di-sec-butyl-	11.01	1
N-Methylmethoxyamine	4.75	1
Pyrolidine	11.27	1
1-Tosylpiperazine	7.39	
Benzylmethyl-	9.58	1
Piperidine	11.22	1
N-Carbethoxypiperazin	8.28	1
Dietrimethylsilylmethyl-	11.40	1
Diallyl-	9.29	1
N-Methylhydroxyl-	5.96	1
Trimethyleneimine	11.29	1
Cis-2,6-dimethyl-piperidine	10.92	3

Tertiary amines

Trimethyl-	9.76	1
Dimethyldiethyl-	10.29	1
Dimethyl-n-propyl-	9.99	1
Dimethyl-isobutyl-	9.91	1
Dimethyl-sec-butyl-	10.40	1
Tri-n-propyl-	10.65	1
Triallyl-	8.31	1
N-Allylpiperidine	9.69	2

1-Diethylamino-hexane-thiol-(6)**Cyanoamines**

N-piperidine-CH ₂ CN	4.55	8
Et ₂ NCN	-2.0	8
Et ₂ N(CH ₂) ₂ CN	7.65	8
Et ₂ N(CH ₂) ₄ CN	10.08	8
Et ₂ NC(CH ₃) ₂ CN	9.13	8
EtN(CH ₂ CN) ₂	-0.6	8
EtN(CH ₂ CH ₂ CN) ₂	4.55	8
H ₂ NCH ₂ CN	5.34	8
N-Amphetamine-(CH ₂) ₂ -CN	7.23	8
N-Norcodeine-(CH ₂) ₂ CN	5.68	8
Dimethylcyanamide	1.2	9
Diethylcyanamide	1.2	9
Aminoacetonitrile	5.3	9
Diethylaminoacetonitrile	4.5	9

Methyl- -diethylamino-ethyl-sulfide

1,2-Dimethyl- ² -pyrroline	11.94	2
1-methyl-2-n-butyl- ² -pyrroline	11.90	
1-Ethyl-2-methyl- ² -pyrroline	11.92	2
1-n-Butyl-2-methyl- ² -pyrroline	11.90	2
1,2-Dimethyl- ² -tetrahydropyridine	11.57	2
N-Ethyl derivative of: 1,2-Imino-ethane	7.93	7
Trans-2,3-Iminobutane	9.47	7
Trimethylhydroxylamine	3.65	12
Dimethylethyl-	9.99	1
Triethyl-	10.65	1
Dimethyl-n-butyl-	10.02	1
Dimethyl-isopropyl-	10.30	1
Dimethyl-t-butyl-	10.52	1
Tri-n-butyl-	10.89	1
Diallylmethyl-	8.79	1
1-n-Propylpiperidine	10.48	2
10.1	10.1	5
9.8	--	5
1,2-Dimethylpyrrolidine	10.26	2
1-Methyl-2-n-butylpyrrolidin	10.24	2
1-Ethyl-2-methylpyrrolidine	10.64	2
1-n-Butyl-2-methylpyrrolidine	10.43	2
1-Ethyl-2-methylpyrrolidine	10.70	2
1,2-Iminobutane	8.18	7
cis-2,3-Iminobutane	8.56	7
N-dimethylhydroxylamine	5.20	12
Allyldimethyl	8.78	1
1,2-Dimethylpiperidine	10.26	2
1-Ethyl-2-methyl- ² -tetrahydropyridine	11.57	2

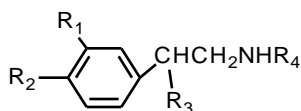
2-Amino-2-cyanopropane	5.3	9
-Isopropylaminopropionitrile	8.0	9
-Diethylaminopropionitrile	7.6	9
Et ₂ NCH ₂ CN	4.55	8
Et ₂ N(CH ₂) ₃ CN	9.29	8
Et ₂ N(CH ₂) ₅ CN	10.46	8
HN(CH ₂ CN) ₂	0.2	8
HN(CH ₂ CH ₂ CN) ₂	5.26	8
N(CH ₂ CH ₂ CN) ₃	1.1	8
N-piperidine-C(CH ₃) ₂ CN	9.22	8
N-Methamphetamine-(CH ₂) ₂ CN	6.95	8
Methyl cyanamide	1.2	9
Ethyl cyanamide	1.2	9
Cyanamide	1.1	9
Dimethylaminoacetonitrile	4.2	9

-Aminopropionitrile	7.7	9
-Dimethylaminopropionitrile	7.0	9
, "-Dicyanodiethylamine	5.2	9
For complex chelating agents of aliphatic amines, see also ref. 77.		

Fluoro-substituted amines

CF ₃ CH ₂ NH ₂	5.7	10
CF ₃ CH ₂ N(CH ₃) ₂	4.75	10

CF ₃ CH ₂ NHCH ₃	6.05	10
Phenylethylamines		
2-phenylethylamine	9.78	11
N-methyl-2-(3,4-dihydroxyphenyl)-ethylamine	8.78	11
N-methyl-2-phenyl	10.31	11
Epinephrine	8.55	11
Arterenol	8.55	11



ref. 11

R ₁	R ₂	R ₃	R ₄	pK
H	H	H	H	9.78
H	H	OH	H	8.90
H	OH	OH	H	8.81
OH	H	OH	H	8.67
H	OH	H	H	9.22
OH	OH	H	H	8.93
OH	OH	OH	H	8.58
H	H	H	CH ₃	10.31
H	H	OH	CH ₃	9.31
H	OH	OH	CH ₂	8.62
OH	H	OH	CH ₃	8.89
H	OH	H	CH ₃	9.36
OH	OH	H	CH ₃	8.78
OH	OH	OH	CH ₃	8.55

Ring amines and imines (in 80% methyl cellosolve) (ref. 2)

Pentamethylene	9.99	Cyclotridecyl	9.63
Hexamethylene	10.00	Cyclotetradecyl	9.54
Heptamethylene	9.77	Cyclopentadecyl	9.54
Octamethylene	9.39	Cycloheptadecyl	9.57
Nonamethylene	9.14	Cyclooctadecyl	9.54
Decamethylene	9.04	Amines other	
Undecamethylene	9.14	Dimeoone	5.23 18
Dodecamethylene	9.31	Phthalimide	8.30 18
Tridecamethylene	9.35	Nitrourea	4.57 18
Tetradecamethylene	9.35	Nitrourethane	3.28 18
Hexadecamethylene	9.29	Diphenylthiocarbazone	4.5 6
Heptadecamethylene	9.27	, , "-Triaminotriethylamine	8.42, 9.44, 10.13 87
Cyclohexyl	9.82	Anilines Ref. 2	
Cycloheptyl	9.99	Monosubstituted	
Cyclooctyl		Substituent	o m p
Cyclononyl	9.95	H-	4.62* 4.64* 4.58*
Cyclodecyl	9.85		
Cycloundecyl	9.71		
Cyclododecyl	9.62		

(CH ₃) ₃ N ⁺ -		2.26	2.51	p-(CH ₃) ₃ C-	4.65
CH ₃ O ₂ C-	2.16	3.56	2.30	m-Br-	3.08
CH ₃ SO ₂ -		2.68*	1.48	m-Cl-	3.09
CH ₃ S-		4.05	4.40	p-F-	4.01
Br-	2.60*	3.51*	3.91*	p-(CH ₃) ₃ Si-	3.99
F-	2.96*	3.38*	4.52*	p-CH ₃ O-	5.14, 5.16
CH ₃ O-	4.49*	4.20*	5.29*		
C ₆ H ₅ -	3.78*	4.18	4.27*		
(CH ₃) ₃ C-	3.78				
-O ₃ S-		3.80	3.32		
H ₃ N ⁺	1.3	2.65	3.29		
O ₂ N-	-0.28*	2.45*	0.98*, 1.11*		
HO ₂ C-	2.04	3.05	2.32		
C ₂ H ₅ O ₂ C-	2.10		2.38		
F ₃ C-		3.49*	2.57*		
HO-	4.72	4.17	5.50		
Cl-	2.62*	3.32*	3.81*		
(CH ₃) ₃ Si-		4.64*	4.36*		
C ₂ H ₅ O-	4.47*	4.17*	5.25*		
CH ₃ -	4.38*	4.67*	5.07*		
-HO ₃ As	3.77	4.05	4.05		
H ₂ N-	4.47	4.88	6.08		

*Thermodynamic

Dimethyl

H	5.07	52
m-NO ₂	2.63	52
m-CN	2.97	52
p-NO ₂	0.61	52
p-CN	1.78	52
p-NO	4.54	52

Dimethyl (in 50% ethanol)

Substituent XC₆H₄N(CH₃)₂ ref. 2

H-	4.21, 4.09
m-CH ₃	4.66
p-C ₂ H ₅ -	4.69
o-(CH ₃) ₂ CH-	5.05
p-CH ₃ CH ₂ CH ₂ CH ₂ -	4.62
o-(CH ₃) ₃ C-	4.26
p-I-	3.43, 2.73
p-Br-	3.52, 2.82
p-Cl-	3.33
m-(CH ₃) ₃ Si-	4.41
o-CH ₃ O-	5.49
o-CH ₃	5.15, 5.07
p-CH ₃	4.94
p-CH ₃ CH ₂ CH ₂ -	4.43
p-(CH ₃) ₂ CH-	4.77
p-(CH ₃) ₂ CHCH ₂ -	4.19

Ortho-substituted anilines (in 50% ethanol)

H-	4.25
2-CH ₃ -	3.98, 4.09
2,3-(CH ₃) ₂ -	4.42
2,4-(CH ₃) ₂ -	4.61
2,5-(CH ₃) ₂ -	4.17, 4.23
2,6-(CH ₃) ₂ -	3.42, 3.49
3,5-(CH ₃) ₂ -	4.48
2-CH ₃ -	4.09
2-(CH ₃) ₂ CH-	4.06
2-(CH ₃) ₂ C-	3.38
2,6-(CH ₃) ₂ -4-(CH ₃) ₃ C-	3.88
2,4-(CH ₃) ₂ -6-(CH ₃) ₃ -	3.43
2-CH ₃ -4,6-(CH ₃) ₃ C-	3.31
2,4,6-[(CH ₃) ₃ C ₃]-	<2

Substituted Naphthylamines

1-NH ₂ -	3.92*
1-NH ₂ -2-NO ₂ -	-1.6
1-NH ₂ -3-NO ₂ -	2.22
1-NH ₂ -4-NO ₂ -	0.54
1-NH ₂ -5-NO ₂ -	2.80
1-NH ₂ -6-NO ₂ -	3.15
1-NH ₂ -7-NO ₂ -	2.83

1-NH ₂ -8-NO ₂ -	2.79
1-NH ₂ -8-SO ₃ -	1.71
1-NH ₂ -3-SO ₃ -	3.20*
1-NH ₂ -4-SO ₃ -	2.81*
1-NH ₂ -5-SO ₃ -	3.69*
1-NH ₂ -6-SO ₃ -	3.80*
1-NH ₂ -7-SO ₃ -	3.66
1-NH ₂ -8-SO ₃ -	5.03*
2-NH ₂ -	4.11*
2-NH ₂ -1-NO ₂ -	-1.0
2-NH ₂ -3-NO ₂ -	2.93
2-NH ₂ -4-NO ₂ -	2.63
2-NH ₂ -5-NO ₂ -	3.16
2-NH ₂ -6-NO ₂ -	2.75
2-NH ₂ -7-NO ₂ -	3.13
2-NH ₂ -8-NO ₂ -	2.86
2-NH ₂ -1-SO ₃ -	2.35
2-NH ₂ -3-SO ₃ -	--
2-NH ₂ -4-SO ₃ -	3.70
2-NH ₂ -5-SO ₃ -	3.96*
2-NH ₂ -6-SO ₃ -	3.74*
2-NH ₂ -7-SO ₃ -	3.95*
2-NH ₂ -8-SO ₃ -	3.89*

N-substituted anilines*

R	C ₆ H ₅ NHR	C ₆ H ₅ N(CH ₃)R	C ₆ H ₅ NR ₂	2-CH ₃ C ₆ H ₄ NHR	2-CH ₃ C ₆ H ₄ NR ₂
H-	4.58	4.85	4.58	4.39	4.39
CH ₃ -	4.85	5.06	5.06	4.59	5.86
C ₂ H ₅ -	5.11	5.98	6.56	4.92	7.18
n-C ₃ H ₇ -	5.02	--	5.59	--	--
n-C ₄ H ₉ -	4.95	--	~5.7	--	--
i-C ₄ H ₉ -	--	5.20	--	--	--
sec-C ₄ H ₉ -	--	6.04	--	--	--
t-C ₆ H ₁₂ -	6.30	--	--	--	--
Cyclopentyl-	5.30	6.71	--	5.07	--
Cyclohexyl-	5.60	6.35	--	5.34	--
t-C ₄ H ₉ -	6.95	7.52	--	6.49	--

*Thermodynamic

AMINES ref. 77

Primary amines

2-aminoethylsulphonic acid	9.08
Aminomalonic acid	3.32, 9.83
N-n-butylethylenediamine	7.53, 10.30
2,3-diaminobutane, meso	6.92, 9.97
2,3-diaminobutane, racemic	6.91, 10.00
2,2'-diaminodiethyl sulfide	8.84, 9.64
1,3-diamino-2,2-dimethylpropane	8.18, 10.22
N,N'-Di-(2-aminoethyl)-ethylenediamine	3.32, 6.67, 9.20, 9.92
1,2-diamino-2-methylpropane	6.79, 10.00
1,3-Diaminopropan-2-ol	8.23, 9.68
N,N'-Diglycyethylenediamine	7.63, 8.35
Ethylenediamine-N,N'-diacetic acid	5.58, 11.05
Furfurylamine	8.89
2-(2-hydroxypropylamino)-ethylamine	6.94, 9.86
2-(3-hydroxypropylamino)ethylamine	6.78, 9.76
N-Methylaminoacetic acid	2.24, 10.01
Methyl- -amino- -mercaptoproionate	6.56, 8.99
N-n-propylethylenediamine	7.54, 10.34
1,2,3-triaminopropane	3.72, 7.95, 9.59
Tris-(hydroxymethyl)-aminomethane	8.10
2-amino-2'-hydroxydiethyl sulfide	9.04
N-(carbamoylmethyl)-iminodiacetic acid	2.30, 6.60
2,2'-diaminodiethylamine	3.58, 8.86, 9.65
2,3-diamino-2,3-dimethylbutane	6.56, 10.13
3,3'-diaminodi-n-propylamine	8.02, 9.70, 10.7
1,2-Di-(2-aminoethylthio)ethane	8.43, 9.32
1,2-diaminopropane	7.13, 10.00
N,N-diethylethylenediamine	7.07, 10.02
N,N-dimethylethylenediamine	6.63, 9.53
N-Ethylethylenediamine	7.63, 10.56
N-(2-hydroxyethyl)-ethylenediamine	6.83, 9.82
N-isopropylethylenediamine	7.70, 10.62
2-Methoxyethylamine	9.20
Mercaptoethylamine	8.27, 10.53
N-Methylethylenediamine	7.56, 10.40
2-Methylthioethylamine	9.18
2-thienylmethylamine	8.92
Triaminotriethylamine	8.56, 9.59, 10.29

Secondary amines

N-Butylaminoacetic acid	2.29, 10.07
N,N'-Diethylethylenediamine	7.70, 10.46
2,2'-dihydroxydiethylamine	9.00
N,N'-di-n-propylethylenediamine	8.14, 10.97
Ethylenediamine-N,N'-diacetic acid	6.42, 9.46
Iminodipropionic acid	4.11, 9.61
Piperazine	5.68, 9.82
-carboxymethylaminopropionic acid	3.61, 9.46
N,N'-Dimethylethylenediamine	7.40, 10.16
N-ethylaminoacetic acid	2.30, 10.10
Iminodiacetic acid	2.98, 9.89
N-isopropylaminoacetic acid	2.36, 10.06
N-n-propylaminoacetic acid	2.28, 10.03

Tertiary amines

4-(2-aminoethyl)morpholine	4.84, 9.45
Di-(2-hydroxyethyl)aminoacetic acid	8.08
Hexamethylenetetramine	5.13
Methyliminodiacetic acid	2.81, 10.18
Diethylaminoacetic acid	2.04, 10.47
Dimethylaminoacetic acid	2.08, 9.80
N-2-hydroxyethyliminodiacetic acid	2.2, 8.73
Triethylenediamine	4.18, 8.19

Ref. 1

Diallylmethyl	8.79
Benzylldimethyl	8.93
N-Allylpiperidine	9.68
N-Allylmorpholine	7.05
Propargyldimethyl	7.05
Propargylethyldimethyl	8.88
N-Methylmorpholine	7.41
N-Methylpyrrolidine	10.46
N,N-Dimethylhydroxylamine	5.20
Allyldimethyl	8.73
Benzylldiethyl	9.48
N-Ethylpiperidine	10.40
N-Ethylmorpholine	7.70
Propargymethyldimethyl	8.33
N-Methylpiperidine	10.08
N-Methyltrimethyleneimine	10.40
Triethanolamine	7.77
N,N-Dimethylmethoxyamine	3.65

Ref. 5

N-Dimethyl-cysteamine	7.95, 10.7
N-Dipropyl-cysteamine	8.00, 10.8
N- -Mercaptoethyl-morpholine	6.65, 9.8
1-Diethylamino-butan- (4)	10.1

Methyl-[-diethylamino-ethyl]sulfide	9.8
N-Diethyl-cysteamine	7.8, 10.75
N- -Mercaptoethyl-piperidine	7.95, 11.05
1-Diethylamino-propan- (3)	8.0, 10.5
1-Diethylamino-hexan- (6)	10.1

ANILINES (Ref. 88)**m-Substituted anilines**

m-C ₂ H ₅	4.70	m-CH(CH ₃) ₂	4.67	
-C(CH ₃) ₃	4.66	3,5-(CH ₃) ₂		4.74
3,5-[C(CH ₃) ₃] ₂	4.97	m-COCH ₃	3.56	
m-CN	2.76	3-Cl,5-OCH ₃	3.10	
3-OCH ₃ ,5-NO ₂	2.11	3,5-(OCH ₃) ₂	3.82	
3,5-Br ₂	2.34			

NAPHTHALAMINES (reference 88)**substituted naphthalamines**

2-naphthalamine		2-naphthalamine		X	
1-NH ₂ ,3-X	NO ₂	2-NH ₂ ,4-X	NO ₂	I	3.41
	CN		CN		
	Cl		Cl		
	Br		Br		
	COOCH ₃	1-NH ₂ ,6-X	COOCH ₃	OCH ₃	4.05
	OCH ₃		OCH ₃		
	OH		NO ₂		
	CH ₃		Cl		
	Cl		OCH ₃		
2-NH ₂ ,5-X	NO ₂	2-NH ₂ ,7-X	OH	NO ₂	2.73
	OH		NO ₂		
			Cl		
1-NH ₂ ,5-X	NO ₂	2-NH ₂ ,6-X	OCH ₃	Br	3.21
	OH		OH		
	Cl		NH ₂		
1-NH ₂ ,7-X	NH ₂	2-NH ₂ ,8-X	NO ₂	NO ₂	2.73
	NO ₂		OCH ₃		
	Cl				
	OCH ₃	1-NH ₂ ,4-X	NO ₂	Br	3.21
	OH		Br		
			NO ₂		
1-NH ₂ ,2-X	NO ₂	2-NH ₂ ,3-X	NO ₂		1.48
1-X,2-NH ₂	NO ₂				
1-NH ₂ ,8-X	NO ₂				

Anilines (in 50% ethanol)

Unhindered	pK	ref.
Aniline	4.19	40
p-Aminodiphenyl	3.81	40
2-Naphthylamine	3.77	40
3-Phenanthrylamine	3.59	40
m-Aminodiphenyl	3.82	40
2-Aminofluorene	4.21	40
2-Phenanthrylamine	3.60	40
2-Anthrylamine	3.40	40
Hindered		
o-Aminodiphenyl	3.03	40

peri

1-Naphthylamine	3.40	40
9-Phenanthrylamine	3.19	40
3-Aminopyrene	2.91	40
1-Phenanthrylamine	3.23	40
1-Anthrylamine	3.22	40

meso

9-Anthrylamine	2.7	40
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o-Aminophenols

3-Hydroxyanthranilic acid	10.09, 5.20	51
2-Aminophenol hydrochloride	9.99, 4.86	51

Indicators

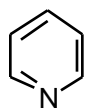
p-Aminoazobenzene	2.82, 2.76	60
4-Chloro-2-nitroaniline	-1.02, -1.03	60
4,6-Dichloro-2-nitroaniline	-3.61, -3.32	60
6-Bromo-2,4-dinitroaniline	-6.64, -6.71	
2-Amino-4,5-dimethylphenol hydrochloride	10.40, 5.28	51
N,N-Dimethyl-2,4-dinitroaniline	-1.00, --	60
p-Nitrodiphenylamine	-2.4 to -2.9, -2.50	60
4-Methyl-2, dinitroaniline	-3.96, -4.44	60

Heterocyclics**Nucleosides, etc.**

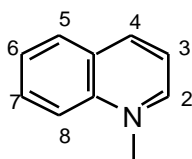
Adenine	4.15, 9.80	6
2'-AMP	3.81, 6.17	6
3'-AMP	3.74, 5.92	6
ADP	3.95, 6.3	36
ATP	4.00 (4.1), 6.5	36
Barbital	7.85, 12.7	37
Cytosine	4.45, 12.2	6
Cytosine (deoxy)	4.25	6
3' CMP	4.16-4.31, 6.04	6
CDP	4.44	6
CDP, (deoxy)	4.8, 6.6	6
Guanine	3.3, 9.2, 12.3	6
Guanosine	2.2, 9.5	6
"	1.6, 9.16, 12.5	35
5'-GMP	2.4, 9.4, 6.1	6
GDP	2.9, 9.6, 6.3	6
Hypoxanthine	1.98, 8.94, 12.10	6

5'-IMP	8.9, 1.54, 6.04	6
5-Methylcytosine	4.6, 12.4	6
5-Methylcytosine deoxyribose 5'-phosphate	4.4	6
3-Methyluracil	9.75	37
3-Methylxanthine	8.5 (8.1), 11.3	38
Adenosine	3.63	6
"	3.3, 12.5	35
5'-AMP	3.3, 6.1	36
"	3.74, 6.2-6.4	6
Barbituric acid	3.9, 12.5	37
Cytidine	4.11	6
"	4.22, 12.5	35
2'-CMP	4.3-4.4, 6.19*	6
5'-CMP	4.5, 6.3	6
CTP	4.6, 6.4	6
2,6-Diaminopurine	5.09, 10.77	6
Isoguanine	4.51, 8.99	6
Guanosine (deoxy)	1.6-2.2, 9.16-9.5	6
GMP (2' + 3')	2.3, 9.36, 0.7, 5.9	6
5'-GMP (deoxy)	2.9, 9.7, 6.4	6
GTP	3.3, 9.3, 6.5	6
Inosine	1.2, 8.9	6
"	8.75, 12.5	6
5-Methylcytosine deoxyribose	4.5, 13.0	6
1-Methyluracil	9.95	37
1-Methylxanthine	7.7, 12.05	38
7-Methylxanthine	8.5 (8.3)	38
9-Methylxanthine	6.3	38
Purine	2.52, 8.90	37
Thymidine	9.8	6
5'-TMP	10.0, 1.6, 6.5	6
Uracil deoxyribose	9.3	6
5'-UMP	9.5, 6.4	6
UTP	9.5, 6.6	6
Uridine	9.25	6
"	9.17, 12.5	35
Xanthosine	0, 5.5, 13.0	6
Orotic acid	2.8, 9.45, 13	6
Pyrimidine	1.30	37
Thymine	0, 9.9, 713.0	6
Uracil	.5, 9.5, 13.0	6
UMP (2' + 3')	9.43, 1.02, 5.88	6
UDP	9.4, 6.5	6
Uric acid	5.4, 10.3	6
Xanthine	0.8, 7.44, 11.12	6
"	7.2	38

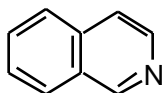
Heterocyclic Bases (Ref. 2)



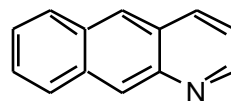
Pyridine 5.14*
pK (20°)



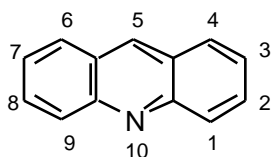
Quinoline 4.85*



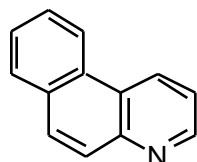
Isoquinoline 5.14*



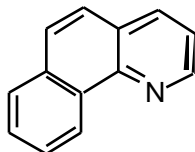
Benzoquinoline 5.05*



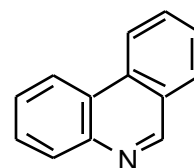
Acridine 5.60



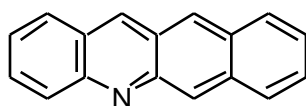
5,6-Benzoquinoline
5.15*



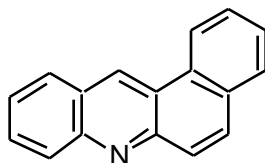
7,8-Benzoquinoline
4.25*



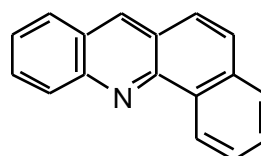
Phenanthridine 3.30^a



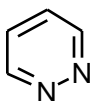
2,3-Benzacridine 4.52^a



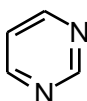
3,4-Benzacridine 4.70*



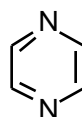
1,2-Benzacridine 3.45^a



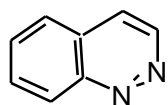
Pyridazine 2.10*



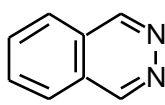
Pyrimidine 1.10*



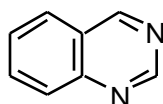
Pyrazine 0.37*



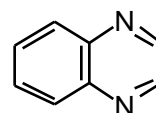
Cinnoline 2.64*



Phthalazine 3.39*



Quinazoline 3.31*



Quinoxaline 0.6*

^a 50% EtOH

Heterocyclics

Aureomycin

3.30, 7.44, 9.27 77

3-Hydroxy

8.81, 5.52

39

Iridine

--, 5.62 39

5-Hydroxy (acridone)

--f, -0.32

39

5-Methoxy

--, 7

39

Acridine

1--

2--

3--

4--

5--

9--

Ref. 2

H--	5.60*	4.11 ^a			
H ₂ N--	4.40*	8.04*	5.88*	6.04*	9.99*
	3.59 ^a	7.61 ^a	5.03 ^a	5.50 ^a	9.45 ^a
HO--	4.18 ^a	4.86 ^a	5.52 ³⁹	4.45 ^a	-.32 ³⁹
	10.7 ^a	9.9 ^a	8.81 ³⁹	9.4*	>12
CH ₃ --	3.95 ^a		4.60 ^a		4.70 ^a
H ₂ K-(1-CH ₃ --)--				4.79 ^a	9.73 ^s
1,9-(CH ₃) ₂ --	2.88 ^a				3.22 ^a

^a 50% ethanol; ref. 39

8-amino-1,2-benzacridine	6.72	40
2-amino-4-methyl-5,6-benzoquinoline	7.14	
	40	
3-amino-6,7-benzoquinoline	4.78	40
8-amino-3,4-benzacridine	7.42	40
1'-amino-5,6-benzoquinoline	5.03	40
4'-amino-5,6-benzoquinoline	5.20	40
2-amino-4-methyl-7,8,benzoquinoline		
	6.74	40
6,7-benzoquinoline	5.05, 3.84 ^a	19
5,6-benzoquinoline	5.15, 3.90 ^a	19
4-amino-	7.99 ^a	19
2-methyl-	4.44 ^a	19
4-amino-2-methyl-	8.45 ^a	19
2-amino-4-methyl-	7.14, 6.51 ^a	19
4'-amino-	5.20, 4.10 ^a	19
3'-amino-	4.02 ^a	19
1'-amino-	5.03	19
2',4'-diamino-	4.91 ^a	19
Benziminazole	5.53	19
2-amino-	7.54	19
Benztriazole	1.6	19
Benzthiazole	1.2, 0.1 ^a	19
2-amino-	4.51	19
benzoxazole	(decomp.)	19
2-amino-	3.73	19
2,3-benzacridine	4.52 ^a	19
5-amino-	9.72 ^a	19
5-acetamido-	4.56 ^a	19
7-amino-	5.38 ^a	19
5-amino-6:7:8:9-tetrahydro-	9.66 ^a	19
Caffeine	0.61	4
cinchonine	7.2	4
Cinnoline	2.70	19
4-amino-	6.84	19
Cocaine	7.6	4
Cinnoline 4-hydroxy	9.27, 0.35	39
6-hydroxy	7.52, 3.65	39
-hydroxy	8.20, 2.74	39

, '-dipyridyl	4.43	6
4-amino-	8.75 ^a	19
4-amino-2-methyl-	9.45 ^a	19
4-amino-2-methyl-8-chloro-	5.95 ^a	19
8-chloro-	2.5 ^a	19
3,4-diamino-	8.15 ^a	19
3-amino-	4.78, 3.73 ^a	19
7,8-benzquinoline	4.25, 3.15 ^a	19
4-amino-	7.68 ^a	19
4-amino-2-methyl-	7.96 ^a	19
2-amino-4-methyl-	6.74, 6.02 ^a	19
6-amino-2-methyl-	5.23 ^a	19
1'-amino-2-methyl-	4.75 ^a	19
3,4-benzacridine	4.70, 4.16 ^a	19
5-amino	8.41 ^a	19
7-amino-	5.03 ^a	19
8-amino-	7.42 (6.51) ^a	19
8-acetamido-	4.48 ^a	19
8-dimethylamino-	7.31, 6.99	19
1,2-benzacridine	3.45 ^a	19
5-amino-	8.13 ^a	19
7-amino	4.05 ^a	19
8-amino-	6.72, 5.97 ^a	19
4',5-diamino-	8.44 ^a	19
Cinnoline	--, 0.21	39
3-hydroxy	8.64, 0.21	39
5-hydroxy	7.40, 1.92	39
7-hydroxy	7.56, 3.31	39
4-methoxy	--, 3.21	39

Heterocyclics

o,o'-dipyridyl	4.43	6
hydantoin	9.16	42
5-isopropyl-2-thio-	8.70	42
5,5-pentamethylene2-thio	8.79	42
3,5,5-trimethyl-2-thio	10.80	42
3-methyl-5,5-pentamethylene-2-thio-	11.23	42

Imidazoles

2-Methylimidazole	7.75	43
N-Acetylhistidine	7.05	43
2-Methyl-4-hydroxy-aminobenz-	6.65	43
4-Hydroxymethyl-	6.45	43
2-Methylbenz-	6.1	43
Histamine	6.0	43
4-Hydroxy-6-aminobenz-	5.9	43
4-Hydroxybenz-	5.3 (OH 9.5)	43
4-Methoxybenz-	5.1	43
4-Bromo-	3.7	43
6-Nitrobenz-	3.05, 10.6	43
4-Nitro-	1.5, 9.1	43
isoQuinolines		
1-Hydroxy-	-1.2	44
5-Hydroxy	5.40, 8.45	44
3-Amino-	5.05	40
5-Amino-	5.59	40
Amino-	6.20	40
6-Hydroxy-	5.85, 9.15	44
8-Hydroxy-	5.66, 8.40	44
2-Methylisoquinolone	-1.8	44
Isoquinoline	5.46, 5.14	44, 19
Phenazine	--, 1.23	39
2-Hydroxy-	7.5, 2.6	39
10-Methyl-2-phenazone	--, 3.0	
6-Aminophenanthridine	6.88	40
9-Aminophenanthridine	7.31	40
o-Phenanthroline	4.27 ^a , 5.2	19
p-Phenanthroline	3.12 ^a	19
1,10-Diamino-3,8-Dimethyl-	8.78 ^a , 6.31 ^a	
Phenanthridine	--, 4.65	44
6-Hydroxy-	8.43, 5.35	44
9-Hydroxy (phenanthridone)	<-1.5	44
9-Amino-	7.31, 6.75 ^a	19
2,7,9-Triamino-	8.06 ^a	19
Phthalazine	3.47	19
1-Amino-	6.60	19
1-Hydroxy-	11.00, -2	39
Picolinic acid	5.52	4
5,5-dimethyl-2-thio-	8.71	42
5,5-Diphenyl-2-thio-	7.69	42
1-Methyl-5,5-pentamethyl-ene-2-thio-		
	9.25	42
4-Methyl-	7.45	43
Imidazole	6.95	43
4-(2',4'-Dihydroxyphenyl)-	6.45	43
Carbobenzoxy-L-histidyl-L-tyrosine ethyl ester	6.25	43
6-Aminobenz-	6.0 (NH ₂ 3.0)	
Benzimidazole	5.4	43

Histidine	methylester	
	5.2 (NH ₂ 7.1)	
	43	
2-Methyl-4-hydroxy-6-nitro-benzimidazole		
	3.9	43
4-Hydroxy-6-Nitrobenz-	3.05	43
b ² -Hydroxymethylnaphth(1,2)-		
	4.44, 12.23	86
b ² -Hydroxymethylnaphth(2,3)-		
	4.50, 12.23	86
4-Hydroxy-	4.80, 8.68	44
1-Amino-	7.62	40
4-Amino-	6.28	40
6-Amino-	7.17	40
8-Amino-	6.06	40
7-Hydroxy-	5.70	40
1-Methoxy-	3.05	44
4-NO ₂	1.35	88
4-Br	3.31	88
1-Hydroxy-	--, 1.44	39
5-Methyl-1-phenazone	--, 4.9	39
m-Phenanthroline	3.11 ^a	19
1-Amino-	ca. 7.3, 7.29 ^a	19
2,2'-Dipyridyl	4.23	19
2-Hydroxy-	8.79, 4.82	44
7-Hydroxy-	4.38, 8.68	44
9-Methoxy-	--, 2.38	44
2-Amino-9-methyl-	5.66 ^a	19
2,7-Diamino-9-methyl-	6.26 ^a	19
6-Amino-	6.88	40
Phenazine	1.23	19
1-Amino-	2.6 ^a	19
2-Amino-	4.75, 3.46 ^a	19
1,3-Diamino-	5.64 ^a	19
2,3-Diamino-	4.74	19
2,7-Diamino-	4.63, 3.9 ^a	19
Pteroylglutamic acid	8.26	77
Pyridines		
2-Amino-	6.86	41
4-Amino-	9.17	41
2-Methyl-	5.94 ^b	45
2-Vinyl-	4.98	45
2-Chloro-	0.49	45
2,4,6-Trihydroxy-	4.6, 9.0, 13	39
1-Methyl-4-pyridone	3.33	
2-(N-Methylacetamido)-	2.01	46
2-Benzamido-	3.33	
2-(N-Methylbenzamido)-	1.44	
3-(N-Methylacetamido)-	3.52	46
3-(N-Methylbenzamido)-	3.66	46
4-(N-Methylacetamido)-	4.62	46

4-(N-Methylbenzamido)-	4.68	46	(CH ₃) ₂ CH-	5.83 ^b	5.72 ^b	6.02 ^b
4-Benzamido-	5.32	46	CH ₃ CO		3.18 ^b	
3-NO ₂	0.81	88	H ₂ N-	6.68 ^b	5.80 ^b	8.96 ^b
3-COO ⁻	4.77	47	CONH ₂ ⁴⁷		3.40	3.61
2,3-Me ₂	6.60	48	NC- ⁴⁷		1.45	
2,5-Me ₂	6.47	48				
3,4-Me ₂	6.52	48				
2,4,6-Me ₃	7.48	48				
4-OEt	6.67	48				
3-Cl	2.84	48				
3-CO ₂ Et	3.35	48				
3-COOH	3.13	88				
2-Amyl-	6.00 ^b	45				
2-Hexyl-	5.95 ^b	45				
2-Benzyl-	5.13	45				
2-Bromo-	0.71	45				
2,4-Dihydroxy	6.50, 13, 1.37	39				
1-Methyl-2-pyridone	0.32	39				
2-Acetamido-	4.09	46				
1-Methylpyrid-2-one acetylimine	7.12	46				
3-Acetamido-	4.46	46				
3-Benzamido-	3.80	46				
1-Methylpyrid-4-one acetylimine						
	11.03	46				
1-Methylpyrid-4-one benzylimine	9.89	46				
4-COO ⁻	4.90	47				
2,4-Me ₂	6.72	48				
2,6-Me ₂	6.77	48				
3,5-Me ₂	6.14	48				
2-Me,5-Et	6.51	48				
3-F	3.10	48				
3-Br	2.84	48				
4-CO ₂ Et	3.45	48				
Pyridine N-oxides (see oxygen acids)						

Substituted Pyridines

Pyridine	2-	3-	4-
H-	5.17 ^b		
Cl-	0.72 ^b	2.84 ^b	
I-	1.82 ^b	3.25 ^b	
CH ₃ CH ₂ -	5.97 ^b	5.70 ^b	6.02 ^b
(CH ₃) ₃ C-	5.76 ^b	5.82 ^b	5.99 ^b
HO-	0.75	4.86	3.27
	11.62	8.72	11.09
SO ₃ ⁻⁴⁷		2.9	
CH ₃ O-	3.28	4.88	6.62
F-	-0.44 ^b	2.97 ^b	
Br-	0.90 ^b	2.84 ^b	
CH ₃ -	5.97 ^b	5.68 ^b	6.02 ^b

Ortho-Substituted Pyridines (in 50% ethanol)

Substituent	pK	ref.
H-	4.38	2
2-C ₂ H ₅ -	4.93	2
2-(CH ₃)	4.68	2
2,6-[(CH ₃) ₂ CH] ₂	3.58	2
2-(CH ₃) ₃ C-	4.68	2
2-C ₂ H ₅ -6-(CH ₃) ₃ C-	4.36	2
2,6-[(CH ₃) ₃ C] ₂ ⁻	3.58	2
2-CH ₃ -	5.05	2
2-(CH ₃) ₂ CH-	4.82	2
2,6-(CH ₃) ₂	5.77	2
2,6-[(CH ₃) ₃ C] ₂	3.58	2
2-CH ₃ -6-(CH ₃) ₃ C	5.52	2
2-(CH ₃) ₂ CH-6-(CH ₃) ₃ C-	5.13	2

Pyridazine	2.33	19
3-Hydroxy-	10.46, -1.8	39
3,6-Dihydroxy-	5,67, -2.2, 13	39
4-Methoxy-	3.70	39
3-Amino-	5.19	19
4-Hydroxy-	8.68, 1.07	39
3-Methoxy-	2.52	39
3,6-Dimethoxy-	1.61	39

For complex chelating agents, see also ref. 77
b thermodynamic at 25°.

		pK _{NH}	35°	pK _{OH}	
Benzimidazole	6.00	5.58	5.36		
2-Methyl	6.96	6.29	6.18	---	
2-Ethyl	6.90	6.27	6.14	--	
2-Hydroxymethyl	---	5.40	---	11.55	ref. 86
1-Methyl-2-hydroxymethyl	---	5.55	---	11.45	

2,4-Dihydroxy-(Uracil)	9.38, 12	39
4,6-Dihydroxy-	5.4	39
2,4,6-Trihydroxy-(Barbituric acid)		

Other (ref. 95)

Thiazolidine	6.31
Methyl thiazolidine-4-carboxylate	4.00
Thiazolidine-4-COOH	1.51, 6.21

(ref. 96)

2-Methyl- 2-oxazoline	5.5
4-Carbamoyl-2-phenyl- 2-oxazoline	2.9
2-Phenyl- 2-oxazoline	4.4

Heterocyclics

Pyrazines	pK	ref.
Pyrazine	1.1, 0.6	49, 39
2,5-Dimethyl-	2.1	49
2,3,5,6-Tetramethyl-	2.8	49
2-Methoxy-	--, 0.75	39
2-Methyl-	1.5	49
2,6-Dimethyl-	2.5	49
2-Hydroxy-	8.23, 0.1	39
1-Methyl-2-pyrazine	-0.04	39
2-Amino-	3.14	19
Pyrimidine	1.30	19
2-Amino-	3.54	19
5-Amino-	2.83	19
2-Amino-4,6-dimethyl-	4.85	19
2,4,6-Triamino-	6.84	19
2-Hydroxy-	9.17, 2.24	39

2-Methoxy-	3.9, 12.5	39
4-Methoxy-	<1	39
1-Methyl-2-pyrimidone	2.5	39
3-Methyl-4-pyrimidone	1.84	39
4-Amino-	5.71	19
2-Amino-4-methyl-	4.15	19
2,4-Diamino-	7.26	19
4-Methyl-	1.98	19
4-Hydroxy-	8.59, 1.85	39
4,5-Dihydroxy-	7.48, 1.99, 11.61	39
2,4,5-Trihydroxy-(isoBarbituric acid)		
	8.11, 11.48	39
4-Hydroxy-5-methoxy-	8.60	1.75
	39	
1-Methyl-4-pyrimidone	1.8	39

Miscellaneous

4-Hydroxy-2-methylpyridazinium chloride		
	1.74	44
8-Hydroxy-6-methyl-1,6-naphthyridinium chloride	4.34	44
2-Hydroxyphenazine	2.6	44
4-Hydroxypteridine	-0.17	44
3-Methyl-4-pteridone	-0.47	44
5-Hydroxypyrimidine	1.87, 6.78	44
8-Hydroxy-1,6-Naphthyridine	4.08	44
1-Hydroxyphenazine	1.44	44

5-Methyl-1-phenazone	4.9	44
10-Methyl-2-phenazone	3.0	44
1-Methyl-4-pteridone	1.25	44

Quinoline	2--	3	4	5	6	7	8	Ref.
H-	4.85*	4.80	4.69*					2
H ₂ N-	7.25*	4.86*	9.08*	5.37*	5.54*	6.56*	3.90*	2
HO-	-.36	4.30	2.27	5.20	5.17	5.48	5.13	44
	11.74	8.06	11.25	8.54	8.88	8.85	9.89	44
CH ₃	5.42	5.14	5.20	4.62	4.92	5.08	4.60	2
	5.8		5.6		5.2		5.0	2
F-		2.36*		3.68*	4.00*	4.04*	3.08*	2
Cl-					3.73*			2
HO ₂ C	4.96*	4.62*	4.53*	4.81*	4.98*	4.97*	7.20*	2
NO ₂		1.03 ⁸⁸						

Quinoline		
2,4-Dihydroxy-	5.86, 0.76	39
4-Methoxy-	6.65	59
1-Methyl-4-quinolone	2.46	39
2,4-Diamino-	9.45	19
Quinazoline	3.51, 3.2 ^a	19
2-Amino-	4.43	19
6-Amino-	3.2 ^a	19
2-Hydroxy-	10.69, 1.30	39
6-Hydroxy-	8.19, 3.12	39
3-Methiodide	7.26	39
2-Methoxy-	1.31	39
2-Methoxy-	3.17	39
1-Methyl-2-quinolone	-0.71	39
4-Amino-	9.44, 9.17	19, 41
8-Quinolinol	5.13, 9.89	6
3-Cl	--, 2.46	88, 44
3-Br	2.61	88
4-Amino-	5.73	19
8-Amono-	2.4 ^a	19
4-Hydroxy-	9.81, 2.12	39
8-Hydroxy-	8.65, 3.41	39
2,4-Dihydroxy-	9.78, 2.5	39
4-Methoxy-	3.13	39
*Thermodynamic		

Heterocyclics		
Quinoxaline	0.8, 0.56	19, 39
2-Amino-	3.96	19
6-Amino-	2.95	19
2-Hydroxy-	9.08, -1.37	39
1-Methiodide	5.74	39
2,3-Dihydroxy-	9.52	39

5-Hydroxy-1-methylquinoxalinium chloride

	5.74	44
Riboflavin	9.93	77
Sulphadiazine	6.48	6
Sulphapyridine	8.43	6
2-Aminothiazole	5.39	41
1,3,5-Triazine	--	39
2,4-Dihydroxy-	6.5	39
1,4,6-Triazanaphthalene	2.5	39
4-Hydroxy-	11.05, 0.78	39
5-Amino-	2.62	19
2,3-Diamino-	4.70	19
5-Hydroxy-	8.65, 0.9	39
6-Hydroxy-	7.92, 1.40	39
1,5-Naphthyridine	2.91	39
4-Hydroxy	10.01, 2.85	39
Sulphaquanidine	11.25	6
Sulphathiazole	7.12	6
Terramycin	3.10, 7.26, 9.11	
	77	
Tetramethylenediamine	10.7	4
1,4,5-Triazanaphthalene	1.20	39
8-Hydroxy-	8.76, 0.60	39

SPECIAL NITROGEN COMPOUNDS

Hydroxylamines

Hydroxylamine	5.97*	12
N-Methyl-	5.96*	12
O-Methyl-	4.60*	12
Trimethyl-	3.65*	12
N-Dimethyl-	5.20*	12
N,O-Dimethyl-	4.75*	12

Hydrazines (30°)		
Hydrazine	8.07	13
Methyl-	7.87	13
N,N'-Dimethyl-	7.52	13
Tetramethyl-	6.30	13
N,N-Diethyl-	7.71	13
Phenyl-	5.21 (15°)	14
Glycylhydrazide	2.38, 7.69	15
N,N-Dimethyl-	7.21	13
Trimethyl-	6.56	13
Ethyl-	7.99	13
N,N'-Diethyl-	7.78	13
Acet-	3.24	15
Isonicotinhydrazide	1.85, 3.54, 10.77	77

Hydrazones Hydrazone of:		
Benzophenone	3.85	16
p,p'-Dimethoxy-	4.38	16
p-Chloro-	4.38	16
p-Methoxyacetophenone	4.94	16
p,p'-Dichloro-	3.13	16
Phenyl-2-thienyl ketone	3.80	16

Semicarbazones of:		
Semicarbazide	3.66	
Furfural	1.44	14
Benzaldehyde	0.96	14
Acetone	1.33	14
Acetaldehyde	1.10	14
Pyruvic acid	0.59	14

Amidoximes		
Ox-	3.02	17
Benz-	4.99	17
-Phenylacet-	5.24	17
Succin-	3.11, 5.97	17
o-Tolu-	4.03	17
p-Tolu-	5.14	17
Malon-	~4.77	17

Other		
Diphenylthiocarbazone	4.5	6
Phthalimide	8.30	18
Nitrourethane	3.28	18
Acetylguanidine	8.33	19
Acetamidine	12.52	19
O-Methylisourea	9.80	20
Dimedone	5.23	18
Nitrourea	4.57	18
Guanidine	13.71	19

Phenylguanidine	10.88	19
Benzamidine	11.6	19
N-Phenyl-O-methylisourea	7.3	20

Nitrogen compounds, miscellaneous		
Diguanide--	3.07, 13.25	77
Dithiooxamide (rubeanic acid, H ₂ NCSCSNH ₂)	10.62	77
Ethylenediguanide	1.74, 2.88, 11.34, 11.76	77
Phenyldiguanide	2.16, 10.71	77

Other		
S-Methylisothiurea	9.83	20
N-Phenyl-S-methylisothiurea	7.14	20

Cinchona Alkaloids (in 80% aqueous methyl cellosolve)		
Quinine	7.73	2
Quinidine	7.95	2
Ephedrine	9.14	2
N-Methylephedrine	8.50	2
Epiquinine	8.44	2
Epiquinidine	8.32	2
-Ephedrine	9.22	2
N-Methyl- -ephedrine	8.81	2

Acetamide	-0.51	4
Urea	0.18	4
Thiourea	-0.96	4

Thiols		
N-Dimethyl-cysteamine	7.95, 10.7	7
N-Dipropyl-cysteamine	8.00 10.8	5
N- -Mercaptoethyl-morpholine	6.65, 9.8	
1-Diethylamino-butan- (4)	10.1	5
Methyl-[-diethylamino-ethyl]-sulfide		9.8
	5	
Methyl thioglycolate	7.8	23
Mercaptoethylamine	8.6, 10.75	23
N-trimethyl cysteine	8.6	23
Glutathione	2.12, 3.59, 8.75, 9.65	23
N-Diethyl-cysteamine	7.8, 10.75	5
N- -Mercaptoethyl-piperidine	7.95, 11.05	5
1-Diethylamino-propan- (3)	8.0, 10.5	5
1-Diethylamino-hexan- (6)	10.1	5

p-Nitrobenzenethiol	5.1	58
Thioglycolic acid	3.67, 10.31	23
Mercaptoethanol	9.5	23
Cysteine	1.8, 8.3, 10.8	23
Cysteinylcysteine	2.65, 7.27, 9.35, 10.85	23

X=	-H	-S-	-SH
X(CH ₂) ₂ SH	12.0	13.96	10.75
X(CH ₂) ₄ SH	12.4	13.25	11.50
X(CH ₂) ₃ SH	13.24	11.14	
X(CH ₂) ₅ SH		13.27	11.82

o-Mercapto-phenylacetic acid	4.28, 7.67	59
Ethyl mercaptan	10.50	81
I-Thio-D-sorbitol	9.35	91
2-mercaptoethanesulfonate	7.53 (9.1)	81
o-aminothiophenol	6.59	81
Thiophenol	8.20 ^a , 7.8, 6.52	59, 81, 82
-Mercaptopropionic acid	10.27	81
Methyl cysteine	6.5 (7.5)	
	81	
p-Cl-thiophenol	7.50	81

Mercaptans, RSH

R		
CH ₃ CCH ₂ -	7.86	32
C ₆ H ₅ CH ₂ -	9.43	82
HOCH ₂ CH(OH)CH ₂ -	9.51	82
CH ₂ =CHCH ₂ -	9.96	82
n-C ₄ H ₉ -	10.66	82
t-C ₅ H ₁₁ -	11.21	82
C ₂ H ₅ OCOCH ₂ -	7.95	82
C ₂ H ₅ OCH ₂ CH ₂ -	9.38	82
HOCH ₂ CH(OH)CH ₂ -	9.66	82
n-C ₃ H ₇ -	10.65	82
t-C ₄ H ₉ -	11.05	82

CARBON ACIDS

Acetone	~20	24
Acetylacetone	8.95	24
Diacetylacetone	6	24
Hydrocyanic acid	9.21	25
1-nitropropane	9	18
Saccharin	1.6	18
Tri-methylsulfonyl-methane	strong	24

Dicyanomethane	12	2
Acetonitrile	c. 25	24
Benzoylacetone (anol)	8.23	24
Dimethylsulfone	14	24
Nitroethane	8.6	18
2-nitropropane	7.74	18
Tricyanomethane	strong	24
Trinitromethane	strong	24
Nitromethane	strong	25

Bis-(β-Diketones):[(RCO)(R'CO)CH]₂CHR (in 50% dioxane)

(ref. 28)

R	R'	R''	pK	pK
CH ₃	CH ₃	(CH ₂) ₅ CH ₃	11.33	12.52
CH ₃	CH ₃	C ₆ H ₅	11.10	12.49
CH ₃	CH ₃	2-ClC ₆ H ₄	11.04	12.73
CH ₃	CH ₃	2-C ₅ H ₄ N	9.80	12.46
CH ₃	CH ₃	2-CH ₃ OC ₆ H ₄	11.47	12.44
CH ₃	CH ₃	3,4-CH ₂ O ₂ C ₆ H ₃	11.39	12.60
CH ₃	CH ₃	3-C ₅ H ₄ N	10.29	12.63
CH ₃	CH ₃	4-CH ₃ OC ₆ H ₄	11.62	12.61
CH ₃	CH ₃	4-(CH ₃) ₂ NC ₆ H ₄	11.50	12.45
CH ₃	CH ₃ OCH ₂	C ₆ H ₅	11.54	12.27
CH ₃	CH ₃ OCH ₂	2-C ₅ H ₄ N	10.95	12.49
CH ₃	CH ₃ OCH ₂	4-(CH ₃) ₂ NC ₆ H ₄	12.13	12.31
CH ₃	CH ₃ OCH ₂	4-CH ₃ OC ₆ H ₄	11.74	12.49
	CH ₃ OCH ₂ COCH ₂ COCH ₃		9.66	
	(CH ₃ CO) ₂ CH(CH ₂) ₃ CH ₃		12.07	

Bis-(β-Diketones) (RCO)-(R'CO)CH-Y-CH(COR)(COR') (in 50% dioxane)

(ref. 26)

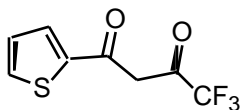
R	R'	Y	pK	pK
CH ₃	CH ₃		9.43	13.54
CH ₃	CH ₃	(CH ₂) ₄	11.99	12.48
CH ₃	CH ₃	(CH ₂) ₁₀	12.01	12.07
CH ₃	CH ₃	1,4-(CH ₃) ₂ C ₆ H ₄	11.27	12.15

Bis-(β-Diketones) RCOCH₂CO-Y-COCH₂COR (in 75% dioxane)

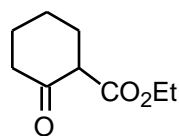
(ref. 26)

R	Y	pK	pK
C ₆ H ₅	(CH ₂) ₄	12.47	13.09
C ₆ H ₅	(CH ₂) ₅	12.72	13.46
C ₆ H ₅	(CH ₂) ₆	12.60	13.46
C ₆ H ₅	(CH ₂) ₇	13.1 (est.)	
C ₆ H ₅	(CH ₂) ₃	12.58	13.69
CH ₃	(CH ₂) ₅	12.29	13.00
CH ₃ =CH(CH ₃) ₂	(CH ₂) ₅	12.95	13.60

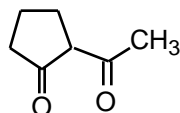
CH ₃ NO ₂	10.29	74
CH ₃ CHClNO ₂	7	74
CH ₃ COCH ₂ NO ₂	5.1	74
CH(NO ₂) ₃	strong	74
CH ₃ COCHCl ₂	15	74
CH ₃ COCHC ₂ H ₅ CO ₂ C ₂ H ₅	12.7	74
CH ₃ COCHCH ₃ COCH ₃	11	74
CH ₃ COCH ₂ COC ₆ H ₅	9.4	74
C ₆ H ₅ COCH ₂ COCF ₃	6.82	74
CH ₃ COCH ₂ CHO	5.92	74
CH ₃ COCH ₂ CO ₂ CH ₃	10	74
CH ₃ SO ₂ CH ₂ SO ₂ CH ₃	14	74
CH ₃ SO ₂ CH(COCH ₃) ₂	4.3	74
C ₂ H ₅ NO ₂	8.6	74
C ₂ H ₅ O ₂ CCH ₂ NO ₂	5.82	74
CH ₂ (NO ₂) ₂	3.57	74
CH ₃ COCH ₂ Cl	c. 16.5	74
CH ₃ COCH ₂ CO ₂ C ₂ H ₅	10.68	74
CH ₃ COCH ₂ COCH ₃	9	74
CH ₃ COCHBrCOCH ₃	7	74
CH ₃ COCH ₂ COCF ₃	4.7	74
C ₆ H ₅ COCH ₂ NC ₅ H ₅	10.51	74
CH(COCH ₃) ₃	5.85	74
CH ₃ SO ₂ CH ₃	c. 23	74
CH(SO ₂ CH ₃) ₃	strong	74
CH ₂ (CN) ₂	11.81	74
C ₂ H ₅ O ₂ CCH ₂ CN	9	74
CH ₃ CO ₂ C ₂ H ₅	~ 24.5	74
CHC ₂ H ₅ (CO ₂ C ₂ H ₅) ₂	15	74
CH ₃ CONH ₂	~ 25	74



6.10 74



10.96 74



7.82 74

Dinitromethane

4 2

Potassium cyanide

9.21 2

CH(CN)₃

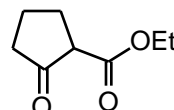
strong 74

CH₂(CO₂C₂H₅)₂

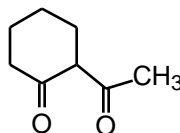
13.3 74

CH₃CO₂H

~ 24 74



10.5 74



10.1 74

CH₂(CHO)₂

5 74

Indicators

Tropeoline OO	2.0	28
Bromocresol green	4.9	28
Thymol blue (1)	1.65	28
Methyl orange	3.45	28
Methyl yellow	3.25	28
Neutral red 7.4	28	
Bromophenol blue	4.1	28
Bromothymol blue	7.3	28
Thymol blue (2)	9.2	28
Methyl red (1)	2.3	28
Methyl red (2)	5.0	28

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