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Handbook of Analytical Chemistry

Translated from the Russian by

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MIR PUBLISHERS

MOSCOW

Table 40

Standard Oxidizing Potentials (E^0) Relative to
the Potential of a Standard Hydrogen Electrode* at 25 °C

(↓ = saturated solution in the presence of a solid or liquid substance;
↑ = solution saturated with gas under a pressure of 1 atm)

Symbol of element	Highest degree of oxidation	+ne	Lowest degree of oxidation	E^0 , V	
Ag	Ag^{2+}	+e	Ag^+	+2.00	
	Ag^+	+e	$\text{Ag} \downarrow$	+0.7994	
	$\text{AgBr} \downarrow$	+e	$\text{Ag} \downarrow + \text{Br}^-$	+0.071	
	$\text{AgBrO}_3 \downarrow$	+e	$\text{Ag} \downarrow + \text{BrO}_3^-$	+0.55	
	$\text{AgC}_2\text{H}_3\text{O}_2 \downarrow$	+e	$\text{Ag} \downarrow + \text{C}_2\text{H}_3\text{O}_2^-$	+0.64	
	$\text{AgCN} \downarrow$	+e	$\text{Ag} \downarrow + \text{CN}^-$	-0.04	
	$\text{Ag}(\text{CN})_2^-$	+e	$\text{Ag} \downarrow + 2\text{CN}^-$	-0.29	
	$\text{Ag}(\text{CN})_3^{2-}$	+e	$\text{Ag} \downarrow + 3\text{CN}^-$	-0.51	
	$\text{AgCNO} \downarrow$	+e	$\text{Ag} \downarrow + \text{CNO}^-$	+0.41	
	$\text{Ag}_2\text{CO}_3 \downarrow$	+2e	$2\text{Ag} \downarrow + \text{CO}_3^{2-}$	+0.46	
	$\text{Ag}_2\text{C}_2\text{O}_4 \downarrow$	+2e	$2\text{Ag} \downarrow + \text{C}_2\text{O}_4^{2-}$	+0.472	
	$\text{AgCl} \downarrow$	+e	$\text{Ag} \downarrow + \text{Cl}^-$	+0.224	
	$\text{Ag}_2\text{CrO}_4 \downarrow$	+2e	$2\text{Ag} \downarrow + \text{CrO}_4^{2-}$	+0.447	
	$\text{Ag}_4\text{Fe}(\text{CN})_6 \downarrow$	+4e	$4\text{Ag} \downarrow + \text{Fe}(\text{CN})_6^{4-}$	+0.194	
	$\text{AgI} \downarrow$	+e	$\text{Ag} \downarrow + \text{I}^-$	-0.152	
	$\text{AgIO}_3 \downarrow$	+e	$\text{Ag} \downarrow + \text{IO}_3^-$	+0.35	
	$\text{Ag}_2\text{MoO}_4 \downarrow$	+2e	$2\text{Ag} \downarrow + \text{MoO}_4^{2-}$	+0.49	
	$\text{Ag}(\text{NH}_3)_2^+$	+e	$\text{Ag} \downarrow + 2\text{NH}_3$	+0.373	
	$\text{AgNO}_2 \downarrow$	+e	$\text{Ag} \downarrow + \text{NO}_2^-$	+0.59	
	$\text{AgN}_3 \downarrow$	+e	$\text{Ag} \downarrow + \text{N}_3^-$	+0.293	
	$2\text{AgO} \downarrow + \text{H}_2\text{O}$	+2e	$\text{Ag}_2\text{O} \downarrow + 2\text{OH}^-$	+0.60	
	$\text{AgO}^+ + 2\text{H}^+$	+e	$\text{Ag}^{2+} + \text{H}_2\text{O}$	~+2.1	
	$\text{Ag}_2\text{O} \downarrow + \text{H}_2\text{O}$	+2e	$2\text{Ag} \downarrow + 2\text{OH}^-$	+0.344	
	$\text{Ag}_2\text{O}_3 \downarrow + \text{H}_2\text{O}$	+2e	$2\text{AgO} \downarrow + 2\text{OH}^-$	+0.74	
	$\text{Ag}_2\text{S} \downarrow$	+2e	$2\text{Ag} \downarrow + \text{S}^{2-}$	-0.71	
	$\text{AgSCN} \downarrow$	+e	$\text{Ag} \downarrow + \text{SCN}^-$	+0.09	
	$\text{Ag}(\text{SO}_3)_2^-$	+e	$\text{Ag} \downarrow + 2\text{SO}_3^{2-}$	+0.43	
	$\text{Ag}(\text{S}_2\text{O}_3)_2^{3-}$	+e	$\text{Ag} \downarrow + 2\text{S}_2\text{O}_3^{2-}$	+0.01	
	$\text{Ag}_2\text{SO}_4 \downarrow$	+2e	$2\text{Ag} \downarrow + \text{SO}_4^{2-}$	+0.653	
	$\text{Ag}_2\text{WO}_4 \downarrow$	+2e	$2\text{Ag} \downarrow + \text{WO}_4^{2-}$	+0.53	
	Al	Al^{3+}	+3e	$\text{Al} \downarrow$	-1.66
		$\text{AlO}_2^- + 2\text{H}_2\text{O}$	+3e	$\text{Al} \downarrow + 4\text{OH}^-$	-2.35
$\text{Al}(\text{OH})_3 \downarrow$		+3e	$\text{Al} \downarrow + 3\text{OH}^-$	-2.31	
AlF_6^{3-}		+3e	$\text{Al} \downarrow + 6\text{F}^-$	-2.07	

*For the use of the table, see p. 476.

Table 40 (continued)

Symbol of element	Highest degree of oxidation	+ne	Lowest degree of oxidation	E ⁰ , V
As	As↓ + 3H ⁺	+3e	AsH ₃ ↑	-0.60
	As↓ + 3H ₂ O	+3e	AsH ₃ ↑ + 3OH ⁻	-1.37
	HAsO ₂ + 3H ⁺	+3e	As↓ + 2H ₂ O	+0.247
	H ₃ AsO ₄ + 2H ⁺	+2e	HAsO ₂ + 2H ₂ O	+0.56
	AsO ₃ ²⁻ + 2H ₂ O	+3e	As↓ + 4OH ⁻	-0.68
	AsO ₄ ³⁻ + 2H ₂ O	+2e	AsO ₂ ⁻ + 4OH ⁻	-0.71
Au	Au ³⁺	+2e	Au ⁺	+1.41
	Au ³⁺	+3e	Au↓	+1.50
	Au ⁺	+e	Au↓	+1.68
	AuBr ₂ ⁻	+e	Au↓ + 2Br ⁻	+0.96
	AuBr ₄ ⁻	+2e	AuBr ₃ + 2Br ⁻	+0.82
	AuBr ₄ ⁻	+3e	Au↓ + 4Br ⁻	+0.87
	Au(CN) ₂ ⁻	+e	Au↓ + 2CN ⁻	-0.61
	AuCl ₂ ⁻	+e	Au↓ + 2Cl ⁻	+1.11
	AuCl ₄ ⁻	+2e	AuCl ₂ ⁻ + 2Cl ⁻	+0.93
	AuCl ₄ ⁻	+3e	Au↓ + 4Cl ⁻	+0.99
	H ₂ AuO ₃ ⁻ + H ₂ O	+3e	Au↓ + 4OH ⁻	+0.7
	Au(SCN) ₂ ⁻	+e	Au↓ + 2SCN ⁻	+0.69
Au(SCN) ₄ ⁻	+2e	Au(SCN) ₂ ⁻ + 2SCN ⁻	+0.64	
Au(SCN) ₄ ⁻	+3e	Au↓ + 4SCN ⁻	+0.66	
B	H ₃ BO ₃ + 3H ⁺	+3e	B↓ + 3H ₂ O	-0.87
	H ₂ BO ₃ ⁻ + H ₂ O	+3e	B↓ + 4OH ⁻	-1.79
	BF ₄ ⁻	+3e	B↓ + 4F ⁻	-1.04
Ba	Ba ²⁺	+2e	Ba↓	-2.90
Be	Be ²⁺	+2e	Be↓	-1.85
	Be ₂ O ₃ ²⁻ + 3H ₂ O	+4e	2Be↓ + 6OH ⁻	-2.62
Bi	BiO ⁺ + 2H ⁺	+3e	Bi↓ + H ₂ O	+0.32
	Bi↓ + 3H ⁺	+3e	BiH ₃ ↑	< -0.8
	NaBiO ₃ ↓ + 4H ⁺	+2e	BiO ⁺ + Na ⁺ + 2H ₂ O	> +1.8
	BiCl ₄ ⁻	+3e	Bi↓ + 4Cl ⁻	+0.16
	Bi ₂ O ₄ ↓ + 4H ⁺	+2e	2BiO ⁺ + 2H ₂ O	+1.59
	Bi ₂ O ₄ ↓ + H ₂ O	+2e	Bi ₂ O ₃ ↓ + 2OH ⁻	+0.56
	Bi ₂ O ₃ ↓ + 3H ₂ O	+6e	2Bi↓ + 6OH ⁻	-0.46
	BiOCl↓ + 2H ⁺	+3e	Bi↓ + H ₂ O + Cl ⁻	+0.16
Br	Br ₂	+2e	2Br ⁻	+1.087
	Br ₃	+2e	3Br ⁻	+1.05
	2HBrO + 2H ⁺	+2e	Br ₂ + 2H ₂ O	+1.6
	2BrO ⁻ + 2H ₂ O	+2e	Br ₂ + 4OH ⁻	+0.45

Table 40 (continued)

Symbol of element	Highest degree of oxidation	+ne	Lowest degree of oxidation	E°, V
Br	HBrO + H ⁺	+2e	Br ⁻ + H ₂ O	+1.34
	BrO ⁻ + H ₂ O	+2e	Br ⁻ + 2OH ⁻	+0.76
	BrO ₃ ⁻ + 5H ⁺	+4e	HBrO + 2H ₂ O	+1.45
	BrO ₃ ⁻ + 2H ₂ O	+4e	BrO ⁻ + 4OH ⁻	+0.54
	2BrO ₃ ⁻ + 12H ⁺	+10e	Br ₂ + 6H ₂ O	+1.52
	2BrO ₃ ⁻ + 6H ₂ O	+10e	Br ₂ + 12OH ⁻	+0.50
	BrO ₃ ⁻ + 6H ⁺	+6e	Br ⁻ + 3H ₂ O	+1.45
	BrO ₃ ⁻ + 3H ₂ O	+6e	Br ⁻ + 6OH ⁻	+0.61
C	CH ₃ OH + 2H ⁺	+2e	CH ₄ ↑ + H ₂ O	+0.59
	C ₂ H ₅ OH + 2H ⁺	+2e	C ₂ H ₆ ↑ + H ₂ O	+0.46
	C ₆ H ₄ O ₂ + 2H ⁺ (quinone)	+2e	C ₆ H ₄ (OH) ₂ (hydroquinone)	+0.6994
	(CN) ₂ ↑ + 2H ⁺	+2e	2HCN	+0.37
	2HCNO + 2H ⁺	+2e	2H ₂ O + (CN) ₂ ↑	+0.33
	HCNO + 2H ⁺	+2e	HCN + H ₂ O	+0.35
	CNO ⁻ + H ₂ O	+2e	CN ⁻ + 2OH ⁻	-0.97
	HCHO + 2H ⁺	+2e	CH ₃ OH	+0.19
	CH ₃ CHO + 2H ⁺	+2e	C ₂ H ₅ OH	+0.19
	HCOOH + 2H ⁺	+2e	HCHO	-0.01
	CH ₃ COOH + 2H ⁺	+2e	CH ₃ CHO	-0.12
	HCOO ⁻ + 2H ₂ O	+2e	HCHO + 3OH ⁻	-1.07
	CO ₂ ↑ + 2H ⁺	+2e	CO ↑ + H ₂ O	-0.12
	CO ₂ ↑ + N ₂ + + 6H ⁺	+6e	CO(NH ₂) ₂ + H ₂ O (urea)	+0.1
	CO ₂ ↑ + 2H ⁺	+2e	HCOOH	-0.20
	2CO ₂ ↑ + 2H ⁺	+2e	H ₂ C ₂ O ₄	-0.49
Ca	Ca ²⁺	+2e	Ca ↓	-2.87
	Ca(OH) ₂ ↓	+2e	Ca ↓ + 2OH ⁻	-3.03
Cd	Cd ²⁺	+2e	Cd ↓	-0.402
	CdCO ₃ ↓	+2e	Cd ↓ + CO ₃ ²⁻	-0.74
	Cd(CN) ₄ ²⁻	+2e	Cd ↓ + 4CN ⁻	-1.09
	Cd(NH ₃) ₄ ²⁺	+2e	Cd ↓ + 4NH ₃	-0.61
	Cd(OH) ₂ ↓	+2e	Cd ↓ + 2OH ⁻	-0.81
	CdS ↓	+2e	Cd ↓ + S ²⁻	-1.17
Ce	Ce ³⁺	+3e	Ce ↓	-2.33
	Ce(ClO ₄) ₃ ²⁻	+e	Ce ³⁺ + 6ClO ₄ ⁻	+1.70
	Ce(NO ₃) ₆ ²⁻	+e	Ce ³⁺ + 6NO ₃ ⁻	+1.60
	Ce(SO ₄) ₃ ²⁻	+e	Ce ³⁺ + 3SO ₄ ²⁻	+1.44
Cl	Cl ₂ ↑	+2e	2Cl ⁻	+1.359
	2HOCl + 2H ⁺	+2e	Cl ₂ ↑ + H ₂ O	+1.63

Table 40 (continued)

Symbol of element	Highest degree of oxidation	+ne	Lowest degree of oxidation	E°, V
Cl	$2\text{ClO}^- + 2\text{H}_2\text{O}$	+2e	$\text{Cl}_2 \uparrow + 4\text{OH}^-$	+0.40
	$\text{HClO} + \text{H}^+$	+2e	$\text{Cl}^- + \text{H}_2\text{O}$	+1.50
	$\text{ClO}^- + \text{H}_2\text{O}$	+2e	$\text{Cl}^- + 2\text{OH}^-$	+0.88
	$\text{HClO}_2 + 2\text{H}^+$	+2e	$\text{HClO} + \text{H}_2\text{O}$	+1.64
	$2\text{HClO}_2 + 6\text{H}^+$	+6e	$\text{Cl}_2 \uparrow + 4\text{H}_2\text{O}$	+1.63
	$\text{HClO}_2 + 3\text{H}^+$	+4e	$\text{Cl}^- + 2\text{H}_2\text{O}$	+1.56
	$\text{ClO}_2^- + \text{H}_2\text{O}$	+2e	$\text{ClO}^- + 2\text{OH}^-$	+0.66
	$\text{ClO}_2^- + 2\text{H}_2\text{O}$	+4e	$\text{Cl}^- + 4\text{OH}^-$	+0.77
	$\text{ClO}_2^- + 3\text{H}^+$	+2e	$\text{HClO}_2 + \text{H}_2\text{O}$	+1.21
	$\text{ClO}_2^- + \text{H}_2\text{O}$	+2e	$\text{ClO}_2^- + 2\text{OH}^-$	+0.33
	$\text{ClO}_2^- + 2\text{H}^+$	+e	$\text{ClO}_2 \uparrow + \text{H}_2\text{O}$	+1.15
	$\text{ClO}_2 \uparrow + \text{H}^+$	+e	HClO_2	+1.27
	$\text{ClO}_2^- + 6\text{H}^+$	+6e	$\text{Cl}^- + 3\text{H}_2\text{O}$	+1.45
	$2\text{ClO}_2^- + 12\text{H}^+$	+10e	$\text{Cl}_2 \uparrow + 6\text{H}_2\text{O}$	+1.47
	$\text{ClO}_2^- + 3\text{H}_2\text{O}$	+6e	$\text{Cl}^- + 6\text{OH}^-$	+0.63
	$\text{ClO}_2 \uparrow + 4\text{H}^+$	+5e	$\text{Cl}^- + 2\text{H}_2\text{O}$	+1.50
	$\text{ClO}_2 \uparrow + 2\text{H}_2\text{O}$	+5e	$\text{Cl}^- + 4\text{OH}^-$	+0.85
	$\text{ClO}_4^- + 2\text{H}^+$	+2e	$\text{ClO}_2^- + \text{H}_2\text{O}$	+1.19
	$\text{ClO}_4^- + \text{H}_2\text{O}$	+2e	$\text{ClO}_2^- + 2\text{OH}^-$	+0.36
	$2\text{ClO}_4^- + 16\text{H}^+$	+14e	$\text{Cl}_2 \uparrow + 8\text{H}_2\text{O}$	+1.39
$\text{ClO}_4^- + 8\text{H}^+$	+8e	$\text{Cl}^- + 4\text{H}_2\text{O}$	+1.38	
$\text{ClO}_4^- + 4\text{H}_2\text{O}$	+8e	$\text{Cl}^- + 8\text{OH}^-$	+0.56	
Co	Co^{3+}	+e	Co^{2+}	+1.84
	Co^{3+}	+3e	$\text{Co} \downarrow$	+0.33
	Co^{2+}	+2e	$\text{Co} \downarrow$	-0.28
	$\text{CoCO}_3 \downarrow$	+2e	$\text{Co} \downarrow + \text{CO}_3^{2-}$	-0.64
	$\text{Co}(\text{NH}_3)_6^{3+}$	+e	$\text{Co}(\text{NH}_3)_6^{2+}$	+0.1
	$\text{Co}(\text{NH}_3)_6^{3+}$	+2e	$\text{Co} \downarrow + 6\text{NH}_3$	-0.42
	$\text{Co}(\text{OH})_2 \downarrow$	+2e	$\text{Co} \downarrow + 2\text{OH}^-$	-0.73
	$\text{Co}(\text{OH})_3 \downarrow$	+e	$\text{Co}(\text{OH})_2 \downarrow + \text{OH}^-$	+0.17
	$\text{CoS } \alpha \downarrow$	+2e	$\text{Co} \downarrow + \text{S}^{2-}$	-0.88
	$\text{CoS } \beta \downarrow$	+2e	$\text{Co} \downarrow + \text{S}^{2-}$	-1.01
Cr	Cr^{3+}	+e	Cr^{2+}	-0.41
	Cr^{3+}	+3e	$\text{Cr} \downarrow$	-0.74
	Cr^{2+}	+2e	$\text{Cr} \downarrow$	-0.91
	$\text{Cr}(\text{OH})_3 \downarrow$	+3e	$\text{Cr} \downarrow + 3\text{OH}^-$	-1.3
	$\text{Cr}(\text{OH})_2 \downarrow$	+2e	$\text{Cr} \downarrow + 2\text{OH}^-$	-1.4
	$\text{CrO}_2^- + 2\text{H}_2\text{O}$	+3e	$\text{Cr} \downarrow + 4\text{OH}^-$	-1.2
	$\text{Cr}_2\text{O}_7^{2-} + 14\text{H}^+$	+6e	$2\text{Cr}^{3+} + 7\text{H}_2\text{O}$	+1.33
	$\text{CrO}_4^{2-} + 4\text{H}_2\text{O}$	+3e	$\text{Cr}(\text{OH})_3 \downarrow + 5\text{OH}^-$	-0.13

Table 40 (continued)

Symbol of element	Highest degree of oxidation	+ne	Lowest degree of oxidation	E^0 , V
Cs	Cs ⁺	+e	Cs↓	-2.914
Cu	Cu ²⁺	+2e	Cu↓	+0.337
	Cu ⁺	+e	Cu↓	+0.521
	Cu ²⁺	+e	Cu ⁺	+0.153
	Cu ²⁺ + Br ⁻	+e	CuBr↓	+0.64
	Cu ²⁺ + Cl ⁻	+e	CuCl↓	+0.54
	Cu ²⁺ + I ⁻	+e	CuI↓	+0.86
	CuBr↓	+e	Cu↓ + Br ⁻	+0.033
	Cu(CN) ₂ ⁻	+e	Cu↓ + 2CN ⁻	-0.43
	CuCl↓	+e	Cu↓ + Cl ⁻	+0.137
	CuI↓	+e	Cu↓ + I ⁻	-0.185
	Cu(NH ₃) ₂ ²⁺	+e	Cu(NH ₃) ₂ ⁺ + 2NH ₃	-0.01
	Cu(NH ₃) ₂ ⁺	+e	Cu↓ + 2NH ₃	-0.12
	Cu(NH ₃) ₄ ²⁺	+2e	Cu↓ + 4NH ₃	-0.07
	2Cu(OH) ₂ ↓	+2e	Cu ₂ O↓ + 2OH ⁻ + H ₂ O	-0.08
	Cu ₂ O↓ + H ₂ O	+2e	2Cu↓ + 2OH ⁻	-0.36
	Cu(OH) ₂ ↓	+2e	Cu↓ + 2OH ⁻	-0.22
	CuS↓	+2e	Cu↓ + S ²⁻	-0.70
Cu ₂ S↓	+2e	2Cu↓ + S ²⁻	-0.88	
CuSCN↓	+e	Cu↓ + SCN ⁻	-0.27	
F	F ₂ ↑	+2e	2F ⁻	+2.87
Fe	Fe ³⁺	+e	Fe ²⁺	+0.771
	Fe ³⁺	+3e	Fe↓	-0.036
	Fe ²⁺	+2e	Fe↓	-0.440
	Fe(CN) ₆ ³⁻	+e	Fe(CN) ₆ ⁴⁻	+0.356
	FeCO ₃ ↓	+2e	Fe↓ + CO ₃ ²⁻	-0.756
	Fe(C ₁₂ H ₈ N ₂) ₃ ³⁺ (1,10-phenanthroline)	+e	Fe(C ₁₂ H ₈ N ₂) ₃ ²⁺	+1.06
	Fe(OH) ₃ ↓	+e	Fe(OH) ₃ ↓ + OH ⁻	-0.56
	Fe(OH) ₂ ↓	+2e	Fe↓ + 2OH ⁻	-0.877
	FeO ₄ ²⁻ + 8H ⁺	+3e	Fe ³⁺ + 4H ₂ O	>+1.9
	Fe ₃ O ₄ ↓ + 8H ⁺	+8e	3Fe↓ + 4H ₂ O	-0.085
FeS↓	+2e	Fe↓ + S ²⁻	-0.95	
Ga	Ga ³⁺	+3e	Ga↓	-0.56
	H ₂ GaO ₃ ⁻ + H ₂ O	+3e	Ga↓ + 4OH ⁻	-1.22
Ge	Ge↓ + 4H ⁺	+4e	GeH ₄ ↑	<-0.3
	Ge ²⁺	+2e	Ge↓	0.0
	GeO↓ + 2H ⁺	+2e	Ge↓ + H ₂ O	-0.29

Table 40 (continued)

Symbol of element	Highest degree of oxidation	+ne	Lowest degree of oxidation	E ⁰ , V
Ge	$\text{GeO}_2 \downarrow + 4\text{H}^+$	+4e	$\text{Ge} \downarrow + 2\text{H}_2\text{O}$	-0.15
	$\text{H}_2\text{GeO}_3 + 4\text{H}^+$	+4e	$\text{Ge} \downarrow + 3\text{H}_2\text{O}$	-0.13
	$\text{GeO}_2 \downarrow + 2\text{H}^+$	+2e	$\text{GeO} \downarrow (\text{brown}) + \text{H}_2\text{O}$	-0.12
	$\text{HGeO}_3^- + 2\text{H}_2\text{O}$	+4e	$\text{Ge} \downarrow + 5\text{OH}^-$	-1.0
H	2H^+	+2e	$\text{H}_2 \uparrow$	±0.0000
	$2\text{H}^+(10^{-7}M)$	+2e	$\text{H}_2 \uparrow$	-0.414
	$\text{H}_2 \uparrow$	+2e	2H^-	-2.25
	$2\text{H}_2\text{O}$	+2e	$\text{H}_2 \uparrow + 2\text{OH}^-$	-0.828
	$\text{H}_2\text{O}_2 + 2\text{H}^+$	+2e	$2\text{H}_2\text{O}$	+1.77
	$\text{HO}_2^- + \text{H}_2\text{O}$	+2e	3OH^-	+0.88
Hf	$\text{HfO}^{2+} + 2\text{H}^+$	+4e	$\text{Hf} \downarrow + \text{H}_2\text{O}$	-1.70
	$\text{HfO}_2 \downarrow + 4\text{H}^+$	+4e	$\text{Hf} \downarrow + 2\text{H}_2\text{O}$	-1.57
	$\text{HfO}(\text{OH})_2 \downarrow + \text{H}_2\text{O}$	+4e	$\text{Hf} \downarrow + 4\text{OH}^-$	-2.50
Hg	2Hg^{2+}	+2e	Hg_2^{2+}	+0.907
	Hg^{2+}	+2e	$\text{Hg} \downarrow$	+0.850
	Hg_2^{2+}	+2e	$\text{Hg} \downarrow$	+0.792
	$\text{Hg}_2\text{Br}_2 \downarrow$	+2e	$2\text{Hg} \downarrow + 2\text{Br}^-$	+0.1392
	$\text{Hg}(\text{CN})_2^-$	+2e	$\text{Hg} \downarrow + 4\text{CN}^-$	-0.37
	$\text{Hg}_2(\text{CH}_3\text{COO})_2 \downarrow$	+2e	$2\text{Hg} \downarrow + 2\text{CH}_3\text{COO}^-$	+0.510
	$\text{Hg}_2\text{C}_2\text{O}_4 \downarrow$	+2e	$2\text{Hg} \downarrow + \text{C}_2\text{O}_4^{2-}$	+0.415
	$\text{Hg}_2\text{Cl}_2 \downarrow$	+2e	$2\text{Hg} \downarrow + 2\text{Cl}^-$	+0.2680
	$\text{Hg}_2\text{I}_2 \downarrow$	+2e	$2\text{Hg} \downarrow + 2\text{I}^-$	-0.040
	$\text{Hg}_2(\text{IO}_3)_2 \downarrow$	+2e	$2\text{Hg} \downarrow + 2\text{IO}_3^-$	+0.394
	$\text{HgO} \downarrow (\text{red}) + \text{H}_2\text{O}$	+2e	$\text{Hg} \downarrow + 2\text{OH}^-$	+0.098
	$\text{HgS} \downarrow (\text{black})$	+2e	$\text{Hg} \downarrow + \text{S}^{2-}$	-0.67
	$\text{HgS} \downarrow (\text{red})$	+2e	$\text{Hg} \downarrow + \text{S}^{2-}$	-0.70
	$\text{Hg}_2\text{SO}_4 \downarrow$	+2e	$\text{Hg} \downarrow + \text{SO}_4^{2-}$	+0.614
I	$\text{I}_2 \downarrow$	+2e	2I^-	+0.536
	I_2	+2e	2I^-	+0.621
	I_3^-	+2e	3I^-	+0.545
	2IBr	+2e	$\text{I}_2 \downarrow + 2\text{Br}^-$	+1.02
	2IBr_2	+2e	$\text{I}_2 \downarrow + 4\text{Br}^-$	+0.87
	ICN	+2e	$\text{I}^- + \text{CN}^-$	+0.30
	$2\text{ICN} + 2\text{H}^+$	+2e	$\text{I}_2 \downarrow + 2\text{HCN}$	+0.63
	2ICl	+2e	$\text{I}_2 \downarrow + 2\text{Cl}^-$	+1.19
	2ICl_2	+2e	$\text{I}_2 \downarrow + 4\text{Cl}^-$	+1.06
	2ICl_3	+6e	$\text{I}_2 \downarrow + 6\text{Cl}^-$	+1.28
	$2\text{HIO} + 2\text{H}^+$	+2e	$\text{I}_2 \downarrow + 2\text{H}_2\text{O}$	+1.45
	$2\text{IO}^- + \text{H}_2\text{O}$	+2e	$\text{I}_2 \downarrow + 4\text{OH}^-$	+0.45

Table 40 (continued)

Symbol of element	Highest degree of oxidation	+ne	Lowest degree of oxidation	E ⁰ , V
I	HIO + H ⁺	+2e	I ⁻ + H ₂ O	+0.99
	IO ⁻ + H ₂ O	+2e	I ⁻ + 2OH ⁻	+0.49
	IO ₃ ⁻ + 5H ⁺	+4e	HIO + 2H ₂ O	+1.14
	IO ₃ ⁻ + 2H ₂ O	+4e	IO ⁻ + 4OH ⁻	+0.14
	2IO ₃ ⁻ + 12H ⁺	+10e	I ₂ ↓ + 6H ₂ O	+1.19
	2IO ₃ ⁻ + 6H ₂ O	+10e	I ₂ ↓ + 12OH ⁻	+0.21
	IO ₃ ⁻ + 6H ⁺	+6e	I ⁻ + 3H ₂ O	+1.08
	IO ₃ ⁻ + 3H ₂ O	+6e	I ⁻ + 6OH ⁻	+0.26
	H ₅ IO ₆ + H ⁺	+2e	IO ₃ ⁻ + 3H ₂ O	~+1.6
	H ₃ IO ₆ ²⁻	+2e	IO ₃ ⁻ + 3OH ⁻	~+0.7
	H ₅ IO ₆ + 7H ⁺	+8e	I ⁻ + 6H ₂ O	~+1.24
	H ₃ IO ₆ ²⁻ + 3H ₂ O	+8e	I ⁻ + 9OH ⁻	~+0.37
	In	In ³⁺	+3e	In↓
In ³⁺		+2e	In ⁺	-0.40
In(OH) ₃ ↓		+3e	In↓ + 3OH ⁻	-1.0
Ir	Ir ³⁺	+3e	Ir↓	~+1.15
	IrCl ₆ ³⁻	+3e	Ir↓ + 6Cl ⁻	+0.77
	IrCl ₅ ²⁻	+e	IrCl ₆ ³⁻	+1.02
	IrCl ₄ ²⁻	+4e	Ir↓ + 6Cl ⁻	+0.83
	IrO ₂ ↓ + 4H ⁺	+4e	Ir↓ + 2H ₂ O	+0.93
	IrO ₂ ↓ + 2H ₂ O	+4e	Ir↓ + 4OH ⁻	+0.1
	Ir ₂ O ₃ ↓ + 3H ₂ O	+6e	2Ir↓ + 6OH ⁻	+0.1
K	K ⁺	+e	K↓	-2.925
La	La ³⁺	+3e	La↓	-2.52
	La(OH) ₃ ↓	+3e	La↓ + 3OH ⁻	-2.90
Li	Li ⁺	+e	Li↓	-3.03
Mg	Mg ²⁺	+2e	Mg↓	-2.37
	Mg(OH) ₂ ↓	+2e	Mg↓ + 2OH ⁻	-2.69
Mn	*✓ Mn ³⁺	+e	Mn ²⁺	+1.51
	*✓ Mn ²⁺	+2e	Mn↓	-1.19
	Mn(CN) ₆ ³⁻	+e	Mn(CN) ₆ ⁴⁻	-0.244
	✓ MnCO ₃ ↓	+2e	Mn↓ + CO ₃ ²⁻	-1.48
	✓ Mn(OH) ₂ ↓	+2e	Mn↓ + 2OH ⁻	-1.18
	✓ Mn(OH) ₃ ↓	+e	Mn(OH) ₂ ↓ + OH ⁻	+0.1
	✓ MnO ₂ + 4H ⁺	+2e	Mn ²⁺ + 2H ₂ O	+1.23

Table 40 (continued)

Symbol of element	Highest degree of oxidation	+ne	Lowest degree of oxidation	E ⁰ , V
Mn	$\text{MnO}_4^{2-} + 4\text{H}^+$	+2e	$\text{MnO}_2 \downarrow + 2\text{H}_2\text{O}$	+2.26
	$\text{MnO}_4^{2-} + 2\text{H}_2\text{O}$	+2e	$\text{MnO}_2 \downarrow + 4\text{OH}^-$	+0.6
	MnO_4^-	+e	$\text{MnO}_2 \downarrow$	+0.56
	$\text{MnO}_4^- + 4\text{H}^+$	+3e	$\text{MnO}_2 + 2\text{H}_2\text{O}$	+1.69
	$\text{MnO}_4^- + 2\text{H}_2\text{O}$	+3e	$\text{MnO}_2 \downarrow + 4\text{OH}^-$	+0.60
	$\text{MnO}_4^- + 8\text{H}^+$	+5e	$\text{Mn}^{2+} + 4\text{H}_2\text{O}$	+1.51
Mo	Mo^{3+}	+3e	$\text{Mo} \downarrow$	-0.2
	$\text{Mo}(\text{CN})_8^{3-}$	+e	$\text{Mo}(\text{CN})_8^{4-}$	+0.73
	$\text{MoO}_4^{2-} + 4\text{H}^+$	+2e	$\text{Mo}^{3+} + 2\text{H}_2\text{O}$	~0.0
	MoO_4^{2-}	+e	MoO_3	+0.48
	$\text{H}_2\text{MoO}_4 + 6\text{H}^+$	+6e	$\text{Mo} \downarrow + 4\text{H}_2\text{O}$	0.0
	$\text{MoO}_4^{2-} + 4\text{H}_2\text{O}$	+6e	$\text{Mo} \downarrow + 8\text{OH}^-$	-1.05
N	$\text{HN}_3 + 11\text{H}^+$	+8e	3NH_4^+	+0.69
	$\text{N}_3^- + 7\text{H}_2\text{O}$	+6e	$\text{N}_2\text{H}_4 + \text{NH}_3 + 7\text{OH}^-$	-0.62
	$3\text{N}_2 \uparrow + 2\text{H}^+$	+2e	2HN_3	-3.1
	$3\text{N}_2 \uparrow$	+2e	2N_3^-	-3.4
	$\text{N}_2 \uparrow + 2\text{H}_2\text{O} + 4\text{H}^+$	+2e	$(2\text{NH}_2\text{OH})\text{H}^+$	-1.87
	$\text{N}_2 \uparrow + 4\text{H}_2\text{O}$	+2e	$2\text{NH}_2\text{OH} + 2\text{OH}^-$	-3.04
	$\text{N}_2 \uparrow + 5\text{H}^+$	+4e	$(\text{N}_2\text{H}_4)\text{H}^+$	-0.23
	$\text{N}_2 \uparrow + 4\text{H}_2\text{O}$	+4e	$\text{N}_2\text{H}_4 + 4\text{OH}^-$	-1.16
	$\text{N}_2 \uparrow + 8\text{H}^+$	+6e	2NH_4^+	+0.26
	$\text{N}_2 \uparrow + 8\text{H}_2\text{O}$	+6e	$2\text{NH}_4\text{OH} + 6\text{OH}^-$	-0.74
	$(\text{N}_2\text{H}_4)\text{H}^+ + 3\text{H}^+$	+2e	2NH_4^+	+1.27
	$\text{N}_2\text{H}_4 + 4\text{H}_2\text{O}$	+2e	$2\text{NH}_4\text{OH} + 2\text{OH}^-$	+0.1
	$(\text{NH}_2\text{OH})\text{H}^+ + 2\text{H}^+$	+2e	$\text{NH}_4^+ + \text{H}_2\text{O}$	+1.35
	$\text{NH}_2\text{OH} + 2\text{H}_2\text{O}$	+2e	$\text{NH}_4\text{OH} + 2\text{OH}^-$	+0.42
	$\text{H}_2\text{N}_2\text{O}_2 + 2\text{H}^+$	+2e	$\text{N}_2 \uparrow + 2\text{H}_2\text{O}$	+2.65
	$\text{H}_2\text{N}_2\text{O}_2 + 6\text{H}^+$	+4e	$(2\text{NH}_2\text{OH})\text{H}^+$	+0.50
	$2\text{HNO}_2 + 4\text{H}^+$	+4e	$\text{H}_2\text{N}_2\text{O}_2 + 2\text{H}_2\text{O}$	+0.83
	$\text{HNO}_2 + \text{H}^+$	+e	$\text{NO} \uparrow + \text{H}_2\text{O}$	+0.99
	$\text{NO}_2^- + \text{H}_2\text{O}$	+e	$\text{NO} \uparrow + 2\text{OH}^-$	-0.46
	$2\text{HNO}_2 + 4\text{H}^+$	+4e	$\text{N}_2\text{O} \uparrow + 3\text{H}_2\text{O}$	+1.29
	$2\text{HNO}_2 + 6\text{H}^+$	+6e	$\text{N}_2 \uparrow + 4\text{H}_2\text{O}$	+1.44
	$2\text{NO}_2^- + 4\text{H}_2\text{O}$	+6e	$\text{N}_2 \uparrow + 8\text{OH}^-$	+0.41
	$\text{HNO}_2 + 7\text{H}^+$	+6e	$\text{NH}_4^+ + 2\text{H}_2\text{O}$	+0.86
	$\text{NO}_2^- + 6\text{H}_2\text{O}$	+6e	$\text{NH}_4\text{OH} + 7\text{OH}^-$	-0.15
	$\text{N}_2\text{O} \uparrow + 2\text{H}^+$	+2e	$\text{N}_2 \uparrow + \text{H}_2\text{O}$	+1.77
	$\text{N}_2\text{O} \uparrow + \text{H}_2\text{O}$	+2e	$\text{N}_2 \uparrow + 2\text{OH}^-$	+0.94
	$2\text{NO} \uparrow + 4\text{H}^+$	+4e	$\text{N}_2 \uparrow + 2\text{H}_2\text{O}$	+1.68
	$2\text{NO} \uparrow + 2\text{H}_2\text{O}$	+4e	$\text{N}_2 \uparrow + 4\text{OH}^-$	+0.85

Table 40 (continued)

Symbol of element	Highest degree of oxidation	+ne	Lowest degree of oxidation	E ⁰ , V
N	$\text{N}_2\text{O}_4 \uparrow + 2\text{H}^+$	+2e	2HNO_2	+1.07
	$\text{N}_2\text{O}_4 \uparrow$	+2e	2NO_2^-	+0.88
	$\text{N}_2\text{O}_4 \uparrow + 8\text{H}^+$	+8e	$\text{N}_2 \uparrow + 4\text{H}_2\text{O}$	+1.35
	$\text{N}_2\text{O}_4 \uparrow + 4\text{H}_2\text{O}$	+8e	$\text{N}_2 \uparrow + 8\text{OH}^-$	+0.53
	$\text{NO}_3^- + 3\text{H}^+$	+2e	$\text{HNO}_2 + \text{H}_2\text{O}$	+0.94
	$\text{NO}_3^- + \text{H}_2\text{O}$	+2e	$\text{NO}_2^- + 2\text{OH}^-$	+0.01
	$\text{NO}_3^- + 2\text{H}^+$	+e	$\text{NO}_2 \uparrow + \text{H}_2\text{O}$	+0.80
	$\text{NO}_3^- + \text{H}_2\text{O}$	+e	$\text{NO}_2 \uparrow + 2\text{OH}^-$	-0.86
	$\text{NO}_3^- + 4\text{H}^+$	+3e	$\text{NO} \uparrow + 2\text{H}_2\text{O}$	+0.96
	$\text{NO}_3^- + 2\text{H}_2\text{O}$	+3e	$\text{NO} \uparrow + 4\text{OH}^-$	-0.14
	$2\text{NO}_3^- + 12\text{H}^+$	+10e	$\text{N}_2 \uparrow + 6\text{H}_2\text{O}$	+1.24
	$\text{NO}_3^- + 8\text{H}^+$	+6e	$(\text{NH}_2\text{OH})\text{H}^+ + 2\text{H}_2\text{O}$	+0.73
	$2\text{NO}_3^- + 17\text{H}^+$	+14e	$(\text{N}_2\text{H}_4)\text{H}^+ + 6\text{H}_2\text{O}$	+0.84
	$\text{NO}_3^- + 10\text{H}^+$	+8e	$\text{NH}_4^+ + 3\text{H}_2\text{O}$	+0.87
$\text{NO}_3^- + 7\text{H}_2\text{O}$	+8e	$\text{NH}_4\text{OH} + 9\text{OH}^-$	-0.12	
Na	Na^+	+e	$\text{Na} \downarrow$	-2.713
Nb	Nb^{3+}	+3e	$\text{Nb} \downarrow$	-1.1
	$\text{Nb}_2\text{O}_5 \downarrow + 10\text{H}^+$	+10e	$\text{Nb} \downarrow + 5\text{H}_2\text{O}$	-0.65
	$\text{NbO}^{3+} + 2\text{H}^+$	+2e	$\text{Nb}^{3+} + \text{H}_2\text{O}$	-0.34
	$\text{NbO}(\text{SO}_4)_2^- + 2\text{H}^+$	+2e	$\text{Nb}^{3+} + \text{H}_2\text{O} + 2\text{SO}_4^{2-}$	-0.1
	$\text{NbO}(\text{SO}_4)_2^- + 2\text{H}^+$	+5e	$\text{Nb} \downarrow + \text{H}_2\text{O} + 2\text{SO}_4^{2-}$	-0.63
Ni	Ni^{2+}	+2e	$\text{Ni} \downarrow$	-0.23
	$\text{Ni}(\text{CN})_4^{2-}$	+e	$\text{Ni}(\text{CN})_3^- + \text{CN}^-$	<-0.4
	$\text{NiCO}_3 \downarrow$	+2e	$\text{Ni} \downarrow + \text{CO}_3^{2-}$	-0.45
	$\text{Ni}(\text{OH})_2 \downarrow$	+2e	$\text{Ni} \downarrow + 2\text{OH}^-$	-0.72
	$\text{Ni}(\text{NH}_3)_6^{2+}$	+2e	$\text{Ni} \downarrow + 6\text{NH}_3$	-0.49
	$\text{NiO}_2 \downarrow + 4\text{H}^+$	+2e	$\text{Ni}^{2+} + 2\text{H}_2\text{O}$	+1.68
	$\text{NiO}_2 \downarrow + 2\text{H}_2\text{O}$	+2e	$\text{Ni}(\text{OH})_2 \downarrow + 2\text{OH}^-$	+0.49
	$\text{NiO}_2 \downarrow + 8\text{H}^+$	+4e	$\text{Ni}^{2+} + 4\text{H}_2\text{O}$	>+1.8
	$\text{NiS } \alpha \downarrow$	+2e	$\text{Ni} + \text{S}^{2-}$	+0.76
	$\text{NiS } \gamma \downarrow$	+2e	$\text{Ni} \downarrow + \text{S}^{2-}$	-0.99
O	$\text{O}_2 \uparrow + 4\text{H}^+$	+4e	$2\text{H}_2\text{O}$	+1.229
	$\text{O}_2 \uparrow + 4\text{H}^+(10^{-7}M)$	+4e	$2\text{H}_2\text{O}$	+0.815
	$\text{O}_2 \uparrow + 2\text{H}_2\text{O}$	+4e	4OH^-	+0.401
	$\text{O}_2 \uparrow + 2\text{H}^+$	+2e	H_2O_2	+0.682
	$\text{O}_2 \uparrow + \text{H}_2\text{O}$	+2e	$\text{HO}_2^- + \text{OH}^-$	-0.076
	$\text{H}_2\text{O}_2 + 2\text{H}^+$	+2e	$2\text{H}_2\text{O}$	+1.77
	$\text{HO}_2^- + \text{H}_2\text{O}$	+2e	3OH^-	+0.88
	$\text{O}_3 \uparrow + 2\text{H}^+$	+2e	$\text{O}_2 \uparrow + \text{H}_2\text{O}$	+2.07
	$\text{O}_3 \uparrow + \text{H}_2\text{O}$	+2e	$\text{O}_2 \uparrow + 2\text{OH}^-$	+1.24

Table 40 (continued)

Symbol of element	Highest degree of oxidation	+ne	Lowest degree of oxidation	E ⁰ , V
Os	Os ²⁺	+2e	Os↓	+0.85
	OsCl ₂ ²⁻	+e	OsCl ₃ ³⁻	+0.85
	OsCl ₃ ³⁻	+3e	Os↓ + 6Cl ⁻	+0.71
	OsCl ₆ ³⁻	+e	Os ²⁺ + 6Cl ⁻	+0.4
	OsO ₄ ↓ + 6Cl ⁻ + 8H ⁺	+4e	OsCl ₃ ³⁻ + 4H ₂ O	+1.0
	OsO ₄ ↓ + 8H ⁺	+8e	Os↓ + 4H ₂ O	+0.85
	HOsO ₅ ⁻ + 4H ₂ O	+8e	Os↓ + 9OH ⁻	+0.02
P	P↓ + 3H ⁺	+3e	PH ₃ ↑	+0.06
	P↓ + 3H ₂ O	+3e	PH ₃ ↑ + 3OH ⁻	-0.89
	H ₃ PO ₂ + H ⁺	+e	P↓ + 2H ₂ O	-0.51
	H ₂ PO ₂ ⁻	+e	P↓ + 2OH ⁻	-2.05
	H ₃ PO ₃ + 3H ⁺	+3e	P↓ + 3H ₂ O	-0.50
	H ₃ PO ₃ + 2H ⁺	+2e	H ₃ PO ₂ + H ₂ O	-0.50
	HPO ₃ ²⁻ + 2H ₂ O	+2e	H ₂ PO ₂ ⁻ + 3OH ⁻	-1.57
	H ₄ P ₂ O ₆ + 2H ⁺	+2e	2H ₃ PO ₃	+0.38
	H ₃ PO ₄ + 5H ⁺	+5e	P↓ + 4H ₂ O	-0.41
	H ₃ PO ₄ + 4H ⁺	+4e	H ₃ PO ₃ + 2H ₂ O	-0.39
	2H ₃ PO ₄ + 2H ⁺	+2e	H ₄ P ₂ O ₆ + 2H ₂ O	-0.94
	H ₃ PO ₄ + 2H ⁺	+2e	H ₃ PO ₃ + H ₂ O	-0.276
	PO ₄ ³⁻ + 2H ₂ O	+2e	HPO ₃ ²⁻ + 3OH ⁻	-1.12
	Pb	Pb ²⁺	+2e	Pb↓
Pb ⁴⁺		+2e	Pb ²⁺	+1.8
Pb ⁴⁺		+4e	Pb↓	+0.84
PbBr ₂ ↓		+2e	Pb↓ + 2Br ⁻	-0.274
PbCO ₃ ↓		+2e	Pb↓ + CO ₃ ²⁻	-0.506
PbCl ₂ ↓		+2e	Pb↓ + 2Cl ⁻	-0.266
PbF ₂ ↓		+2e	Pb↓ + 2F ⁻	-0.350
PbI ₂ ↓		+2e	Pb↓ + 2I ⁻	-0.364
PbO↓ + H ₂ O		+2e	Pb↓ + 2OH ⁻	-0.58
HPbO ₂ ⁻ + H ₂ O		+2e	Pb↓ + 3OH ⁻	-0.54
PbO ₂ ↓ + H ₂ O		+2e	PbO↓ + 2OH ⁻	+0.28
PbO ₂ ↓ + 4H ⁺		+2e	Pb ²⁺ + 2H ₂ O	+1.455
PbO ₂ ↓ + 4H ⁺ + SO ₄ ²⁻		+2e	PbSO ₄ ↓ + 2H ₂ O	+1.68
PbO ₂ ²⁻ + H ₂ O		+2e	PbO ₂ ²⁻ + 2OH ⁻	+0.2
PbS↓		+2e	Pb↓ + S ²⁻	-0.91
PbSO ₄ ↓		+2e	Pb↓ + SO ₄ ²⁻	-0.356
Pd	Pd ²⁺	+2e	Pd↓	+0.987
	PdCl ₂ ²⁻	+2e	Pd↓ + 4Cl ⁻	+0.623
	PdCl ₄ ²⁻	+2e	PdCl ₄ ²⁻ + 2Cl ⁻	+1.29
	PdCl ₆ ²⁻	+4e	Pd↓ + 6Cl ⁻	+0.96
	Pd(OH) ₂ ↓	+2e	Pd↓ + 2OH ⁻	+0.07

Table 40 (continued)

Symbol of element	Highest degree of oxidation	+ne	Lowest degree of oxidation	E ⁰ , V
Pd	Pd(OH) ₄ ↓	+2e	Pd(OH) ₂ ↓ + 2OH ⁻	~+0.73
Pt	Pt ²⁺ PtCl ₄ ²⁻ PtCl ₆ ²⁻ Pt(OH) ₂ ↓ Pt(OH) ₂ ↓ + 2H ⁺	+2e +2e +2e +2e +2e	Pt↓ Pt↓ + 4Cl ⁻ PtCl ₄ ²⁻ + 2Cl ⁻ Pt↓ + 2OH ⁻ Pt↓ + 2H ₂ O	~+1.2 +0.73 +0.720 +0.15 +0.98
Pu	Pu ³⁺ Pu ⁴⁺ PuO ₂ ²⁺ PuO ₂ ²⁺ + 4H ⁺ Pu(OH) ₃ ↓ Pu(OH) ₄ ↓	+3e +e +e +2e +3e +e	Pu↓ Pu ³⁺ PuO ₂ ⁺ Pu ⁴⁺ + 2H ₂ O Pu↓ + 3OH ⁻ Pu(OH) ₃ ↓ + OH ⁻	-2.03 +0.970 +0.916 +1.04 -2.42 -0.95
Ra	Ra ²⁺	+2e	Ra↓	-2.92
Rb	Rb ⁺	+e	Rb↓	-2.93
Re	Re↓ Re ⁺ Re ³⁺ ReO ₂ ↓ + 4H ⁺ ReO ₃ ↓ + 2H ⁺ ReO ₄ ⁻ + 8H ⁺ ReO ₄ ⁻ + 4H ⁺ ReO ₄ ⁻ + 2H ⁺ ReO ₄ ⁻ + 4H ₂ O ReO ₄ ⁻ + 2H ₂ O	+e +2e +3e +4e +2e +7e +3e +e +7e +3e	Re ⁻ Re ⁻ Re↓ Re↓ + 2H ₂ O ReO ₂ ↓ + H ₂ O Re↓ + 4H ₂ O ReO ₂ ↓ + 2H ₂ O ReO ₃ ↓ + 2H ₂ O Re↓ + 8OH ⁻ ReO ₂ ↓ + 4OH ⁻	-0.4 -0.23 ~+0.3 +0.26 +0.4 +0.37 +0.51 +0.77 -0.584 -0.595
Rh	Rh ³⁺ RhCl ₆ ³⁻ Rh ₂ O ₃ ↓ + 6H ⁺ RhO ₂ + 4H ⁺ + + 6Cl ⁻ RhO ₂ ²⁺ + 2H ⁺ RhO ₄ ²⁻ + 6H ⁺	+3e +3e +6e +e +e +2e	Rh↓ Rh↓ + 6Cl ⁻ 2Rh↓ + 3H ₂ O RhCl ₆ ³⁻ + 2H ₂ O Rh ³⁺ + H ₂ O RhO ₂ ²⁺ + 3H ₂ O	~+0.8 +0.44 +0.87 >+1.4 +1.40 +1.46
Ru	Ru ²⁺ RuCl ₃ RuCl ₅ ⁻ RuCl ₅ OH ²⁻ + H ⁺ RuO ₄ ⁻ RuO ₄ ↓	+2e +3e +2e +e +e +e	Ru↓ Ru↓ + 3Cl ⁻ Ru ²⁺ + 5Cl ⁻ RuCl ₅ ²⁻ + H ₂ O RuO ₄ ²⁻ RuO ₄	+0.45 +0.68 +0.3 +1.3 +0.59 +1.00

Table 40 (continued)

Symbol of element	Highest degree of oxidation	+ne	Lowest degree of oxidation	E ⁰ , V
S	S↓	+2e	S ²⁻	-0.48
	S↓ + 2H ⁺	+2e	H ₂ S↑	+0.14
	5S↓	+2e	S ₅ ²⁻	-0.34
	(SCN) ₂ ↑	+2e	2SCN ⁻	+0.77
	S ₄ O ₆ ²⁻	+2e	2S ₂ O ₃ ²⁻	+0.09
	S ₂ O ₃ ²⁻ + 6H ⁺	+4e	2S↑ + 3H ₂ O	+0.5
	2H ₂ SO ₃ + 2H ⁺	+4e	S ₂ O ₃ ²⁻ + 3H ₂ O	+0.40
	2SO ₃ ²⁻ + 3H ₂ O	+4e	S ₂ O ₃ ²⁻ + 6OH ⁻	-0.58
	2H ₂ SO ₃ + H ⁺	+2e	HS ₂ O ₄ ⁻ + 2H ₂ O	-0.08
	2SO ₃ ²⁻ + 2H ₂ O	+2e	S ₂ O ₃ ²⁻ + 4OH ⁻	-1.12
	SO ₃ ²⁻ + 4H ⁺	+2e	H ₂ SO ₃ + H ₂ O	+0.17
	SO ₃ ²⁻ + H ₂ O	+2e	SO ₃ ²⁻ + 2OH ⁻	-0.93
	2SO ₃ ²⁻ + 10H ⁺	+8e	S ₂ O ₃ ²⁻ + 5H ₂ O	+0.29
	2SO ₃ ²⁻ + 5H ₂ O	+8e	S ₂ O ₃ ²⁻ + 10OH ⁻	-0.76
	SO ₃ ²⁻ + 8H ⁺	+6e	S↓ + 4H ₂ O	+0.36
	SO ₃ ²⁻ + 4H ₂ O	+6e	S↓ + 8OH ⁻	-0.75
SO ₃ ²⁻ + 10H ⁺	+8e	H ₂ S + 4H ₂ O	+0.31	
SO ₃ ²⁻ + 4H ₂ O	+8e	S ²⁻ + 8OH ⁻	-0.68	
S ₂ O ₈ ²⁻	+2e	2SO ₄ ²⁻	+2.0	
Sb	Sb↓ + 3H ⁺	+3e	SbH ₃	-0.51
	SbO ⁺ + 2H ⁺	+3e	Sb↓ + H ₂ O	+0.212
	Sb ₂ O ₃ ↓ + 6H ⁺	+6e	2Sb↓ + 3H ₂ O	+0.152
	SbO ₂ ⁻ + 2H ₂ O	+3e	Sb↓ + 4OH ⁻	-0.675
	Sb ₂ O ₄ ↓ + 4H ⁺	+2e	2SbO ⁺ + 2H ₂ O	+0.68
	Sb ₂ O ₅ ↓ + 4H ⁺	+4e	Sb ₂ O ₃ ↓ + 2H ₂ O	+0.69
	Sb ₂ O ₅ ↓ + 6H ⁺	+4e	2SbO ⁺ + 3H ₂ O	+0.58
	SbO ₃ ⁻ + H ₂ O	+2e	SbO ₂ ⁻ + 2OH ⁻	-0.43
Sc	Sc ³⁺	+3e	Sc↓	-2.08
Se	Se↓ + 2H ⁺	+2e	H ₂ Se↑	-0.40
	H ₂ SeO ₃ + 4H ⁺	+4e	Se↓ + 3H ₂ O	+0.74
	SeO ₃ ²⁻ + 3H ₂ O	+4e	Se↓ + 6OH ⁻	-0.366
	SeO ₄ ²⁻ + 4H ⁺	+2e	H ₂ SeO ₃ + H ₂ O	+1.15
	SeO ₄ ²⁻ + H ₂ O	+2e	SeO ₃ ²⁻ + 2OH ⁻	+0.05
Si	Si↓ + 4H ⁺	+4e	SiH ₄ ↑	+0.10
	Si↓ + 4H ₂ O	+4e	SiH ₄ ↑ + 4OH ⁻	-0.73
	SiF ₆ ²⁻	+4e	Si↓ + 6F ⁻	-1.2
	SiO ₂ ↓ + 4H ⁺	+4e	Si↓ + 2H ₂ O	-0.86
	H ₂ SiO ₃ (hydrous) + 4H ⁺	+4e	Si↓ + 3H ₂ O	-0.79
	SiO ₃ ²⁻ + 3H ₂ O	+4e	Si↓ + 6OH ⁻	-1.7

Table 40 (continued)

Symbol of element	Highest degree of oxidation	+ne	Lowest degree of oxidation	E ⁰ , V
Sn	Sn ²⁺	+2e	Sn↓	-0.140
	Sn ⁴⁺	+2e	Sn ²⁺	+0.15
	Sn ⁴⁺	+4e	Sn↓	+0.01
	H ₂ SnO ₃ + H ₂ O	+2e	Sn↓ + 3OH ⁻	-0.91
	Sn(OH) ₆ ²⁻	+2e	H ₂ SnO ₃ + 3OH ⁻ + H ₂ O	-0.93
Sr	Sr ²⁺	+2e	Sr↓	-2.89
Ta	Ta ₂ O ₅ ↓ + 10H ⁺	+10e	2Ta↓ + 5H ₂ O	-0.81
Te	Te↓ + 2H ⁺	+2e	H ₂ Te↑	-0.72
	Te↓	+2e	Te ²⁻	-1.14
	TeO ₂ ↓ + 4H ⁺	+4e	Te↓ + 2H ₂ O	+0.53
	TeO ₂ H ⁺ + 3H ⁺	+4e	Te↓ + 2H ₂ O	+0.56
	TeO ₃ ²⁻ + 3H ₂ O	+4e	Te↓ + 6OH ⁻	-0.57
	H ₆ TeO ₆ ↓ + 2H ⁺	+2e	TeO ₂ ↓ + 4H ₂ O	+1.02
	TeO ₄ ²⁻ + H ₂ O	+2e	TeO ₃ ²⁻ + 2OH ⁻	>+0.4
Th	Th ⁴⁻	+4e	Th↓	-1.90
	Th(OH) ₄ ↓	+4e	Th↓ + 4OH ⁻	-2.48
Ti	Ti ²⁺	+2e	Ti↓	-1.63
	TiO ₂ ↓ + 4H ⁺	+4e	Ti↓ + 2H ₂ O	-0.86
	TiO ₃ ²⁺ + 2H ⁺	+4e	Ti↓ + H ₂ O	~ -0.88
	TiO ₂ ²⁺ + 2H ⁺	+e	Ti ³⁺ + H ₂ O	~ +0.1
	Ti ³⁺	+e	Ti ²⁺	-0.37
	TiF ₆ ²⁻	+4e	Ti↓ + 6F ⁻	-1.19
Tl	Tl ⁺	+e	Tl↓	-0.336
	TlBr↓	+e	Tl↓ + Br ⁻	-0.656
	TlCl↓	+e	Tl↓ + Cl ⁻	-0.557
	TlOH	+e	Tl↓ + OH ⁻	-0.344
	Tl ³⁺	+2e	Tl ⁺	+1.28
	Tl ₂ O ₃ ↓ + 3H ₂ O	+4e	2Tl ⁺ + 6OH ⁻	+0.02
U	U ³⁺	+3e	U↓	-1.8
	U ⁴⁺	+e	U ³⁺	-0.64
	U(OH) ₃ ↓	+3e	U↓ + 3OH ⁻	-2.17
	UO ₂ ↓ + 2H ₂ O	+4e	U↓ + 4OH ⁻	-2.39
	UO ₂ ⁺ + 4H ⁺	+e	U ⁴⁺ + 2H ₂ O	+0.55
	UO ₂ ²⁺	+2e	UO ₂ ↓	+0.45
	UO ₂ ²⁺ + 4H ⁺	+2e	U ⁴⁺ + 2H ₂ O	+0.33

Table 40 (continued)

Symbol of element	Highest degree of oxidation	+ne	Lowest degree of oxidation	E ⁰ , V
V	V ²⁺	+2e	V↓	-1.18
	V ³⁺	+e	V ²⁺	-0.255
	VO ²⁺ + 2H ⁺	+e	V ³⁺ + H ₂ O	+0.337
	VO ²⁺	+e	VO ⁺	-0.044
	VO ₂ ⁺ + 2H ⁺	+e	VO ²⁺ + H ₂ O	+0.9994
	VO ₂ ⁺ + 4H ⁺	+2e	V ³⁺ + 2H ₂ O	+0.668
	VO ₂ ⁺ + 4H ⁺	+3e	V ²⁺ + 2H ₂ O	+0.360
	VO ₂ ⁺ + 4H ⁺	+5e	V↓ + 2H ₂ O	-0.25
	VO ₄ ³⁻ + 6H ⁺	+2e	VO ⁺ + 3H ₂ O	+1.26
	H ₂ VO ₄ ⁻ + 4H ⁺	+e	VO ²⁺ + 3H ₂ O	+1.31
W	WO ₃ ↓ + 4H ⁺	+4e	W↓ + 2H ₂ O	-0.12
	W(CN) ₈ ²⁻	+e	W(CN) ₈ ⁴⁻	+0.457
	W ₂ O ₅ ↓ + 2H ⁺	+2e	2WO ₃ ↓ + H ₂ O	-0.04
	WO ₃ ↓ + 6H ⁺	+6e	W↓ + 3H ₂ O	-0.09
	2WO ₃ ↓ + 2H ⁺	+2e	W ₂ O ₅ ↓ + H ₂ O	-0.03
	WO ₄ ²⁻ + 8H ⁺	+6e	W↓ + 4H ₂ O	+0.05
	WO ₄ ²⁻ + 4H ₂ O	+6e	W↓ + 8OH ⁻	-1.05
Y	Y ³⁺	+3e	Y↓	-2.37
Zn	Zn ²⁺	+2e	Zn↓	-0.7628
	Zn(CN) ₄ ²⁻	+2e	Zn↓ + 4CN ⁻	-1.26
	Zn(NH ₃) ₄ ²⁺	+2e	Zn↓ + 4NH ₃	-1.04
	Zn(OH) ₂ ↓	+2e	Zn↓ + 2OH ⁻	-1.245
	ZnO ₂ ²⁻ + 2H ₂ O	+2e	Zn↓ + 4OH ⁻	-1.216
	ZnS↓ (wurtzite)	+2e	Zn↓ + S ²⁻	-1.40
Zr	ZrO ²⁺ + 2H ⁺	+4e	Zr↓ + H ₂ O	-1.57
	ZrO ₂ ↓ + 4H ⁺	+4e	Zr↓ + 2H ₂ O	-1.43
	H ₂ ZrO ₃ ↓ + H ₂ O	+4e	Zr↓ + 4OH ⁻	-2.36