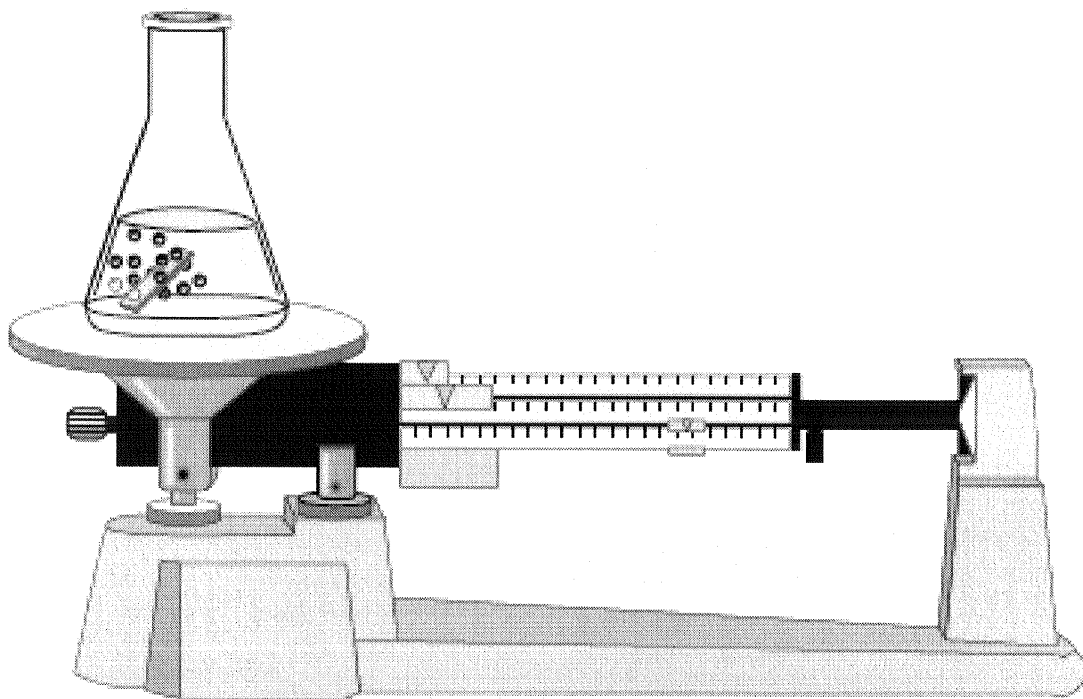


CH40S

Data Booklet

St. James-Assiniboia School
Division



Work done in this booklet
will not be marked.

Periodic Table of the Elements

Group
1

18

1 H Hydrogen 1.01	2 He Helium 4.00																
3 Li Lithium 6.94	4 Be Beryllium 9.01																
11 Na Sodium 23.0	12 Mg Magnesium 24.3																
19 K Potassium 39.1	20 Ca Calcium 40.1	21 Sc Scandium 45.0	22 Ti Titanium 47.9	23 V Vanadium 50.9	24 Cr Chromium 52.0	25 Mn Manganese 54.9	26 Fe Iron 55.8	27 Co Cobalt 58.9	28 Ni Nickel 58.7	29 Cu Copper 63.5	30 Zn Zinc 65.4	31 Ga Gallium 69.7	32 Ge Germanium 72.6	33 As Arsenic 74.9	34 Se Selenium 79.0	35 Br Bromine 79.9	36 Kr Krypton 83.8
37 Rb Rubidium 85.5	38 Sr Strontium 87.6	39 Y Yttrium 88.9	40 Zr Zirconium 91.2	41 Nb Niobium 92.9	42 Mo Molybdenum 95.9	43 Tc Technetium (98)	44 Ru Ruthenium 101.1	45 Rh Rhodium 102.9	46 Pd Palladium 106.4	47 Ag Silver 107.9	48 Cd Cadmium 112.4	49 In Indium 114.8	50 Sn Tin 118.7	51 Sb Antimony 121.7	52 Te Tellurium 127.7	53 I Iodine 126.9	54 Xe Xenon 131.3
55 Cs Cesium 132.9	56 Ba Barium 137.3	57 La* Lanthanum 138.0	72 Hf Hafnium 178.5	73 Ta Tantalum 180.9	74 W Tungsten 183.8	75 Re Rhenium 186.2	76 Os Osmium 190.2	77 Ir Iridium 192.2	78 Pt Platinum 195.1	79 Au Gold 197.0	80 Hg Mercury 200.6	81 Tl Thallium 204.4	82 Pb Lead 207.2	83 Bi Bismuth 209.0	84 Po Polonium (210)	85 At Astatine (210)	86 Rn Radon (222)
87 Fr Francium (223)	88 Ra Radium (226)	89 Ac** Actinium (227)	104 Rf Rutherfordium (261)	105 Db Dubnium (262)	106 Sg Seaborgium (263)	107 Bh Bohrium (264)	108 Hs Hassium (265)	109 Mt Meitnerium (266)									

* 58 Ce Cerium 140.1	59 Pr Praseodyme 140.9	60 Nd Neodymium 144.2	61 Pm Promethium (145)	62 Sm Samarium 150.4	63 Eu Europium 152.0	64 Gd Gadolinium 157.2	65 Tb Terbium 158.9	66 Dy Dysprosium 162.5	67 Ho Holmium 164.9	68 Er Erbium 167.3	69 Tm Thulium 168.9	70 Yb Ytterbium 173.0	71 Lu Lutetium 175.0
** 90 Th Thorium 232.0	91 Pa Protactinium (231)	92 U Uranium 238.0	93 Np Neptunium (237)	94 Pu Plutonium (244)	95 Am Americium (243)	96 Cm Curium (247)	97 Bk Berkelium (247)	98 Cf Californium (251)	99 Es Einsteinium (254)	100 Fm Fermium (257)	101 Md Mendelevium (256)	102 No Nobelium (259)	103 Lr Lawrencium (257)

(Based on a mass of ¹²C at 12.00. Values in parentheses are the mass of the most stable or best known isotopes for elements which do not occur naturally)

Names, Formulas, and Charges of Common Ions

POSITIVE IONS (CATIONS)

Name	Symbol	Name	Symbol
aluminum	Al^{3+}	lithium	Li^+
ammonium	NH_4^+	magnesium	Mg^{2+}
barium	Ba^{2+}	manganese(II)	Mn^{2+}
cadmium	Cd^{2+}	manganese(IV)	Mn^{4+}
calcium	Ca^{2+}	mercury(I)	Hg_2^{2+}
chromium(II)	Cr^{2+}	mercury(II)	Hg^{2+}
chromium(III)	Cr^{3+}	nickel(II)	Ni^{2+}
copper(I)	Cu^+	potassium	K^+
copper(II)	Cu^{2+}	silver	Ag^+
hydrogen,	H^+	sodium	Na^+
iron(II)	Fe^{2+}	strontium	Sr^{2+}
iron(III)	Fe^{3+}	tin(II)	Sn^{2+}
lead(II)	Pb^{2+}	tin(IV)	Sn^{4+}
lead(IV)	Pb^{4+}	zinc	Zn^{2+}

NEGATIVE IONS (ANIONS)

Name	Symbol	Name	Symbol
acetate	$\text{C}_2\text{H}_3\text{O}_2^-$ (CH_3COO^-)	nitrate	NO_3^-
azide	N_3^-	nitride	N^{3-}
bromide	Br^-	nitrite	NO_2^-
bromate	BrO_3^-	oxalate	$\text{C}_2\text{O}_4^{2-}$
carbonate	CO_3^{2-}	hydrogen oxalate	HC_2O_4^-
hydride	H^-	oxide	O^{2-}
hydrogen carbonate	HCO_3^-	perchlorate	ClO_4^-
chlorate	ClO_3^-	permanganate	MnO_4^-
chloride	Cl^-	phosphate	PO_4^{3-}
chlorite	ClO_2^-	monohydrogen phosphate	HPO_4^{2-}
chromate	CrO_4^{2-}	dihydrogen phosphate	H_2PO_4^-
citrate	$\text{C}_6\text{H}_5\text{O}_7^{3-}$	silicate	SiO_3^{2-}
cyanide	CN^-	sulfate (sulphate)	SO_4^{2-}
dichromate	$\text{Cr}_2\text{O}_7^{2-}$	hydrogen sulfate (sulphate)	HSO_4^-
fluoride	F^-	sulfide (sulphide)	S^{2-}
hydroxide	OH^-	hydrogen sulfide (sulphide)	HS^-
hypochlorite	ClO^-	sulfite (sulphite)	SO_3^{2-}
iodide	I^-	hydrogen sulfite (sulphite)	HSO_3^-
iodate	IO_3^-	thiocyanate	SCN^-

Solubility Chart

Negative ions	Positive Ions	Solubility
essentially all	alkali ions (Li^+ , Na^+ , K^+ , Rb^+ , Cs^+)	soluble
essentially all	hydrogen ion $\text{H}^+_{(\text{aq})}$	soluble
essentially all	ammonium ion (NH_4^+)	soluble
nitrate, NO_3^-	essentially all	soluble
acetate, CH_3COO^-	essentially all (EXCEPT Ag^+)	soluble
chloride, Cl^- bromide, Br^- iodide, I^-	Ag^+ , Pb^{2+} , Hg_2^{2+} , Cu^+ , Tl^+	low solubility
	all others	soluble
sulfate, SO_4^{2-}	Ca^{2+} , Sr^{2+} , Ba^{2+} , Pb^{2+} , Ra^{2+}	low solubility
	all others	soluble
sulfide, S^{2-}	alkali ions, $\text{H}^+_{(\text{aq})}$, NH_4^+ , Be^{2+} , Mg^{2+} , Ca^{2+} , Sr^{2+} , Ba^{2+} , Ra^{2+}	soluble
	all others	low solubility
hydroxide, OH^-	alkali ions, $\text{H}^+_{(\text{aq})}$, NH_4^+ , Sr^{2+} , Ba^{2+} , Ra^{2+} , Tl^+	soluble
	all others	low solubility
phosphate, PO_4^{3-} carbonate, CO_3^{2-} sulfite, SO_3^{2-}	alkali ions, $\text{H}^+_{(\text{aq})}$, NH_4^+	soluble
	all others	low solubility
chromate, CrO_4^{2-}	Ba^{2+} , Sr^{2+} , Pb^{2+} , Ag^+	low solubility
	all others	soluble

International Atomic Weights

Name	Symbol	Atomic Number	Atomic Weight	Name	Symbol	Atomic Number	Atomic Weight
Actinium	Ac	89	(227)	Mercury	Hg	80	200.6
Aluminum	Al	13	27.0	Molybdenum	Mo	42	95.9
Americium	Am	95	(243)	Neodymium	Nd	60	144.2
Antimony	Sb	51	121.8	Neon	Ne	10	20.2
Argon	Ar	18	39.9	Neptunium	Np	93	(237)
Arsenic	As	33	74.9	Nickel	Ni	28	58.7
Astatine	At	85	(210)	Niobium	Nb	41	92.9
Barium	Ba	56	137.3	Nitrogen	N	7	14.0
Berkelium	Bk	97	(245)	Osmium	Os	76	190.2
Beryllium	Be	4	9.0	Oxygen	O	8	16.0
Bismuth	Bi	83	209.0	Palladium	Pd	46	106.4
Boron	B	5	10.8	Phosphorus	P	15	31.0
Bromine	Br	35	79.9	Plutonium	Pu	94	(242)
Cadmium	Cd	48	112.4	Polonium	Po	84	210
Calcium	Ca	20	40.1	Potassium	K	19	39.1
Californium	Cf	98	(251)	Platinum	Pt	78	195.1
Carbon	C	6	12.0	Praseodymium	Pr	59	140.9
Cerium	Ce	58	140.1	Promethium	Pm	61	(147)
Cesium	Cs	55	132.9	Promethium	Pm	61	(147)
Chlorine	Cl	17	35.5	Protactinium	Pa	91	(231)
Chromium	Cr	24	52.0	Radium	Ra	88	(226)
Cobalt	Co	27	58.9	Radon	Rn	86	(222)
Copper	Cu	29	63.5	Rhenium	Re	75	186.2
Curium	Cm	96	(247)	Rhodium	Rh	45	102.9
Dysprosium	Dy	66	162.5	Rubidium	Rb	37	85.5
Einsteinium	Es	99	(254)	Ruthenium	Ru	44	101.1
Erbium	Er	68	167.3	Samarium	Sm	62	150.4
Europium	Eu	63	152.0	Scandium	Sc	21	45.0
Fermium	Fm	100	(253)	Selenium	Se	34	79.0
Fluorine	F	9	19.0	Silicon	Si	14	28.1
Francium	Fr	87	(223)	Silver	Ag	47	107.9
Gadolinium	Gd	64	157.3	Sodium	Na	11	23.0
Gallium	Ga	31	69.7	Strontium	Sr	38	87.6
Germanium	Ge	32	72.6	Sulfur	S	16	32.1
Gold	Au	79	197.0	Tantalum	Ta	73	180.9
Hafnium	Hf	72	178.5	Technetium	Tc	43	(99)
Helium	He	2	4.0	Tellurium	Te	52	127.6
Holmium	Ho	67	164.9	Terbium	Tb	65	158.9
Hydrogen	H	1	1.01	Thallium	Tl	81	204.4
Indium	In	49	114.8	Thorium	Th	90	232.0
Iodine	I	53	126.9	Thulium	Tm	69	168.9
Iridium	Ir	77	192.2	Tin	Sn	50	118.7
Iron	Fe	26	55.8	Titanium	Ti	22	47.9
Krypton	Kr	36	83.8	Tungsten	W	74	183.9
Lanthanum	La	57	138.9	Uranium	U	92	238.0
Lead	Pb	82	207.2	Vanadium	V	23	50.9
Lithium	Li	3	6.9	Xenon	Xe	54	131.3
Lutetium	Lu	71	175.0	Ytterbium	Yb	70	173.0
Magnesium	Mg	12	24.3	Yttrium	Y	39	88.9
Manganese	Mn	25	54.9	Zinc	Zn	30	65.4
Mendelevium	Md	101	(256)	Zirconium	Zr	40	91.2

Standard Reduction Potentials

All values are for 1.0 M aqueous solutions at 25°C

<u>Half-Reaction</u>	<u>E° (volts)</u>
$\text{Li}^+ + \text{e}^- \rightarrow \text{Li(s)}$	-3.00
$\text{Rb}^+ + \text{e}^- \rightarrow \text{Rb(s)}$	-2.92
$\text{K}^+ + \text{e}^- \rightarrow \text{K(s)}$	-2.92
$\text{Cs}^+ + \text{e}^- \rightarrow \text{Cs(s)}$	-2.92
$\text{Ba}^{2+} + 2\text{e}^- \rightarrow \text{Ba(s)}$	-2.90
$\text{Sr}^{2+} + 2\text{e}^- \rightarrow \text{Sr(s)}$	-2.89
$\text{Ca}^{2+} + 2\text{e}^- \rightarrow \text{Ca(s)}$	-2.87
$\text{Na}^+ + \text{e}^- \rightarrow \text{Na(s)}$	-2.71
$\text{Mg}^{2+} + 2\text{e}^- \rightarrow \text{Mg(s)}$	-2.37
$\text{Al}^{3+} + 3\text{e}^- \rightarrow \text{Al(s)}$	-1.66
$\text{Mn}^{2+} + 2\text{e}^- \rightarrow \text{Mn(s)}$	-1.18
$2 \text{H}_2\text{O} + 2\text{e}^- \rightarrow 2 \text{OH}^- + \text{H}_2(\text{g})$	-0.83
$\text{Zn}^{2+} + 2\text{e}^- \rightarrow \text{Zn(s)}$	-0.76
$\text{Cr}^{3+} + 3\text{e}^- \rightarrow \text{Cr(s)}$	-0.74
$\text{Te} + 2 \text{H}^+ + 2\text{e}^- \rightarrow \text{H}_2\text{Te(g)}$	-0.72
$\text{Ag}_2\text{S} + 2\text{e}^- \rightarrow 2 \text{Ag(s)} + \text{S}^{2-}$	-0.69
$\text{Cr}^{2+} + 2\text{e}^- \rightarrow \text{Cr(s)}$	-0.56
$\text{Fe}^{2+} + 2\text{e}^- \rightarrow \text{Fe(s)}$	-0.44
$\text{Cr}^{3+} + \text{e}^- \rightarrow \text{Cr}^{2+}$	-0.41
$\text{Se} + 2 \text{H}^+ + 2\text{e}^- \rightarrow \text{H}_2\text{Se(g)}$	-0.40
$\text{Cd}^{2+} + 2\text{e}^- \rightarrow \text{Cd(s)}$	-0.40
$\text{Co}^{2+} + 2\text{e}^- \rightarrow \text{Co(s)}$	-0.28
$\text{Ni}^{2+} + 2\text{e}^- \rightarrow \text{Ni(s)}$	-0.25
$\text{Sn}^{2+} + 2\text{e}^- \rightarrow \text{Sn(s)}$	-0.14
$\text{Pb}^{2+} + 2\text{e}^- \rightarrow \text{Pb(s)}$	-0.13
$\text{Fe}^{3+} + 3\text{e}^- \rightarrow \text{Fe(s)}$	-0.04
$2 \text{H}^+ + 2\text{e}^- \rightarrow \text{H}_2(\text{g})$	0.00
$\text{S} + 2 \text{H}^+ + 2\text{e}^- \rightarrow \text{H}_2\text{S(g)}$	+0.14
$\text{Sn}^{4+} + 2\text{e}^- \rightarrow \text{Sn}^{2+}$	+0.15
$\text{Cu}^{2+} + \text{e}^- \rightarrow \text{Cu}^+$	+0.15
$\text{SO}_4^{2-} + 4 \text{H}^+ + 2\text{e}^- \rightarrow \text{SO}_2(\text{g}) + 2\text{H}_2\text{O}$	+0.17
$\text{Cu}^{2+} + 2\text{e}^- \rightarrow \text{Cu(s)}$	+0.34
$\text{Cu}^+ + \text{e}^- \rightarrow \text{Cu(s)}$	+0.52
$\text{I}_2(\text{s}) + 2\text{e}^- \rightarrow 2 \text{I}^-$	+0.53
$\text{O}_2(\text{g}) + 2 \text{H}^+ + 2\text{e}^- \rightarrow \text{H}_2\text{O}_2$	+0.68
$\text{Fe}^{3+} + \text{e}^- \rightarrow \text{Fe}^{2+}$	+0.77
$\text{NO}_3^- + 2 \text{H}^+ + \text{e}^- \rightarrow \text{NO}_2(\text{g}) + \text{H}_2\text{O}$	+0.78
$\text{Hg}^{2+} + 2\text{e}^- \rightarrow \text{Hg(l)}$	+0.78
$1/2 \text{Hg}_2^{2+} + \text{e}^- \rightarrow \text{Hg(l)}$	+0.79
$\text{Ag}^+ + \text{e}^- \rightarrow \text{Ag(s)}$	+0.80
$\text{NO}_3^- + 4\text{H}^+ + 3\text{e}^- \rightarrow \text{NO(g)} + 2 \text{H}_2\text{O}$	+0.96
$\text{AuCl}_4^- + 3\text{e}^- \rightarrow \text{Au(s)} + 4 \text{Cl}^-$	+1.00
$\text{Br}_2(\text{g}) + 2\text{e}^- \rightarrow 2 \text{Br}^-$	+1.06
$1/2 \text{O}_2(\text{g}) + 2 \text{H}^+ + 2\text{e}^- \rightarrow \text{H}_2\text{O}$	+1.23
$\text{MnO}_2(\text{s}) + 4 \text{H}^+ + 2\text{e}^- \rightarrow \text{Mn}^{2+} + 2\text{H}_2\text{O}$	+1.28
$\text{Cr}_2\text{O}_7^{2-} + 14 \text{H}^+ + 6\text{e}^- \rightarrow 2 \text{Cr}^{3+} + 7\text{H}_2\text{O}$	+1.33
$\text{Cl}_2(\text{g}) + 2\text{e}^- \rightarrow 2 \text{Cl}^-$	+1.36
$\text{Au}^{3+} + 3\text{e}^- \rightarrow \text{Au(s)}$	+1.50
$\text{MnO}_4^- + 8 \text{H}^+ + 5\text{e}^- \rightarrow \text{Mn}^{2+} + 4\text{H}_2\text{O}$	+1.52
$\text{H}_2\text{O}_2 + 2 \text{H}^+ + 2\text{e}^- \rightarrow 2 \text{H}_2\text{O}$	+1.77
$\text{F}_2(\text{g}) + 2\text{e}^- \rightarrow 2 \text{F}^-$	+2.87

Relative Strengths of Acids

*Acids 1.0 mol/L in water at 25°C

<u>Acid</u>	<u>Reaction</u>	<u>K_a</u>
Perchloric acid	$\text{HClO}_4 + \text{H}_2\text{O} \rightarrow \text{H}_3\text{O}^+ + \text{ClO}_4^-$	very large
Hydriodic acid	$\text{HI} + \text{H}_2\text{O} \rightarrow \text{H}_3\text{O}^+ + \text{I}^-$	very large
Hydrobromic acid	$\text{HBr} + \text{H}_2\text{O} \rightarrow \text{H}_3\text{O}^+ + \text{Br}^-$	very large
Hydrochloric acid	$\text{HCl} + \text{H}_2\text{O} \rightarrow \text{H}_3\text{O}^+ + \text{Cl}^-$	very large
Nitric acid	$\text{HNO}_3 + \text{H}_2\text{O} \rightarrow \text{H}_3\text{O}^+ + \text{NO}_3^-$	very large
Sulfuric acid	$\text{H}_2\text{SO}_4 + \text{H}_2\text{O} \rightarrow \text{H}_3\text{O}^+ + \text{HSO}_4^-$	very large
Oxalic acid	$\text{H}_2\text{C}_2\text{O}_4 + \text{H}_2\text{O} \rightarrow \text{H}_3\text{O}^+ + \text{HC}_2\text{O}_4^-$	5.4×10^{-2}
Sulfurous acid	$\text{H}_2\text{SO}_3 + \text{H}_2\text{O} \rightarrow \text{H}_3\text{O}^+ + \text{HSO}_3^-$	1.7×10^{-2}
Hydrogen sulfate ion	$\text{HSO}_4^- + \text{H}_2\text{O} \rightarrow \text{H}_3\text{O}^+ + \text{SO}_4^{2-}$	1.3×10^{-2}
Phosphoric acid	$\text{H}_3\text{PO}_4 + \text{H}_2\text{O} \rightarrow \text{H}_3\text{O}^+ + \text{H}_2\text{PO}_4^-$	7.1×10^{-3}
Ferric ion	$\text{Fe}(\text{H}_2\text{O})_6^{3+} + \text{H}_2\text{O} \rightarrow \text{H}_3\text{O}^+ + \text{Fe}(\text{H}_2\text{O})_5(\text{OH})^{2+}$	6.0×10^{-3}
Hydrogen telluride	$\text{H}_2\text{Te} + \text{H}_2\text{O} \rightarrow \text{H}_3\text{O}^+ + \text{HTe}^-$	2.3×10^{-3}
Hydrofluoric acid	$\text{HF} + \text{H}_2\text{O} \rightarrow \text{H}_3\text{O}^+ + \text{F}^-$	6.7×10^{-4}
Nitrous acid	$\text{HNO}_2 + \text{H}_2\text{O} \rightarrow \text{H}_3\text{O}^+ + \text{NO}_2^-$	5.1×10^{-4}
Hydrogen selenide	$\text{H}_2\text{Se} + \text{H}_2\text{O} \rightarrow \text{H}_3\text{O}^+ + \text{HSe}^-$	1.7×10^{-4}
Chromic ion	$\text{Cr}(\text{H}_2\text{O})_6^{3+} + \text{H}_2\text{O} \rightarrow \text{H}_3\text{O}^+ + \text{Cr}(\text{H}_2\text{O})_5(\text{OH})^{2+}$	1.5×10^{-4}
Benzoic acid	$\text{C}_6\text{H}_5\text{COOH} + \text{H}_2\text{O} \rightarrow \text{H}_3\text{O}^+ + \text{C}_6\text{H}_5\text{COO}^-$	6.6×10^{-5}
Hydrogen oxalate ion	$\text{HC}_2\text{O}_4^- + \text{H}_2\text{O} \rightarrow \text{H}_3\text{O}^+ + \text{C}_2\text{O}_4^{2-}$	5.4×10^{-5}
Acetic acid	$\text{HC}_2\text{H}_3\text{O}_2 + \text{H}_2\text{O} \rightarrow \text{H}_3\text{O}^+ + \text{C}_2\text{H}_3\text{O}_2^-$	1.8×10^{-5}
Aluminum ion	$\text{Al}(\text{H}_2\text{O})_6^{3+} + \text{H}_2\text{O} \rightarrow \text{H}_3\text{O}^+ + \text{Al}(\text{H}_2\text{O})_5(\text{OH})^{2+}$	1.4×10^{-5}
Carbonic acid	$\text{H}_2\text{CO}_3 + \text{H}_2\text{O} \rightarrow \text{H}_3\text{O}^+ + \text{HCO}_3^-$	4.4×10^{-7}
Hydrogen sulfide	$\text{H}_2\text{S} + \text{H}_2\text{O} \rightarrow \text{H}_3\text{O}^+ + \text{HS}^-$	1.0×10^{-7}
Dihydrogen phosphate ion	$\text{H}_2\text{PO}_4^- + \text{H}_2\text{O} \rightarrow \text{H}_3\text{O}^+ + \text{HPO}_4^{2-}$	6.3×10^{-8}
Hydrogen sulfite ion	$\text{HSO}_3^- + \text{H}_2\text{O} \rightarrow \text{H}_3\text{O}^+ + \text{SO}_3^{2-}$	6.2×10^{-8}
Ammonium ion	$\text{NH}_4^+ + \text{H}_2\text{O} \rightarrow \text{H}_3\text{O}^+ + \text{NH}_3$	5.7×10^{-10}
Hydrogen carbonate ion	$\text{HCO}_3^- + \text{H}_2\text{O} \rightarrow \text{H}_3\text{O}^+ + \text{CO}_3^{2-}$	4.7×10^{-11}
Hydrogen telluride ion	$\text{HTe}^- + \text{H}_2\text{O} \rightarrow \text{H}_3\text{O}^+ + \text{Te}^{2-}$	1.0×10^{-11}
Hydrogen peroxide	$\text{H}_2\text{O}_2 + \text{H}_2\text{O} \rightarrow \text{H}_3\text{O}^+ + \text{HO}_2^-$	2.4×10^{-12}
Monohydrogen phosphate	$\text{HPO}_4^{2-} + \text{H}_2\text{O} \rightarrow \text{H}_3\text{O}^+ + \text{PO}_4^{3-}$	4.4×10^{-13}
Hydrogen sulfide ion	$\text{HS}^- + \text{H}_2\text{O} \rightarrow \text{H}_3\text{O}^+ + \text{S}^{2-}$	1.2×10^{-15}
Water	$\text{H}_2\text{O} + \text{H}_2\text{O} \rightarrow \text{H}_3\text{O}^+ + \text{OH}^-$	1.8×10^{-16}
Hydroxide ion	$\text{OH}^- + \text{H}_2\text{O} \rightarrow \text{H}_3\text{O}^+ + \text{O}^{2-}$	$< 10^{-36}$
Ammonia	$\text{NH}_3 + \text{H}_2\text{O} \rightarrow \text{H}_3\text{O}^+ + \text{NH}_2^-$	very small