

CODATA Recommended Key Values for Thermodynamics, 1975

Substance	State	$\Delta H^{\circ}f(298.15\text{ K})$ kJ mol ⁻¹	Foot- note	$S^{\circ}(298.15\text{ K})$ J K ⁻¹ mol ⁻¹	$H^{\circ}(298.15\text{ K})-H^{\circ}(0)$ kJ mol ⁻¹	Foot- note
O	g	249.17 ± 0.10	a	160.946 ± 0.020	6.728 ± 0.003	a
O ₂	g	0	b	205.037 ± 0.033	8.682 ± 0.004	a
H	g	217.997 ± 0.006	a	114.604 ± 0.015	6.197 ± 0.002	a
H ⁺	aq	0	b	0	-----	b
H ₂	g	0	b	130.570 ± 0.033	8.468 ± 0.003	a
OH ⁻	aq	-230.025 ± 0.045	c	-10.71 ± 0.20	-----	c
H ₂ O	l	-285.830 ± 0.042	a	69.950 ± 0.060	13.293 ± 0.021	a
H ₂ O	g	-241.814 ± 0.042	a	188.724 ± 0.040	9.908 ± 0.008	a
He	g	0	b	126.039 ± 0.012	6.197 ± 0.002	a
Ne	g	0	b	146.214 ± 0.016	6.197 ± 0.002	a
Ar	g	0	b	154.732 ± 0.020	6.197 ± 0.002	a
Kr	g	0	b	163.971 ± 0.020	6.197 ± 0.002	a
Xe	g	0	b	169.573 ± 0.020	6.197 ± 0.002	a
F	g	[78.91 ± 0.40]	d	158.640 ± 0.020	6.518 ± 0.004	e
F ⁻	aq	-335.35 ± 0.65	f	-13.18 ± 0.54	-----	g
F ₂	g	0	b	202.685 ± 0.040	8.825 ± 0.004	h
HF	g	-273.30 ± 0.70	i	173.665 ± 0.035	8.599 ± 0.004	j
Cl	g	121.290 ± 0.008	a	165.076 ± 0.020	6.272 ± 0.003	a
Cl ⁻	aq	-167.080 ± 0.088	a	56.73 ± 0.16	-----	a
Cl ₂	g	0	b	222.965 ± 0.040	9.180 ± 0.008	a
HCl	g	-92.31 ± 0.13	a	186.786 ± 0.033	8.640 ± 0.004	a
Br	g	111.86 ± 0.12	a	174.904 ± 0.020	6.197 ± 0.002	a
Br ⁻	aq	-121.50 ± 0.15	a	82.84 ± 0.20	-----	a
Br ₂	l	0	b	152.210 ± 0.040	24.52 ± 0.13	a
Br ₂	g	30.91 ± 0.11	a	245.350 ± 0.054	9.724 ± 0.012	a
HBr	g	-36.38 ± 0.17	a	198.585 ± 0.033	8.648 ± 0.004	a
I	g	106.762 ± 0.040	a	180.673 ± 0.020	6.197 ± 0.002	a
I ⁻	aq	-56.90 ± 0.84	a	106.70 ± 0.20	-----	a
I ₂	g	0	b	116.139 ± 0.080	13.196 ± 0.040	a
I ₂	g	62.421 ± 0.080	a	260.567 ± 0.063	10.117 ± 0.021	a
HI	g	26.36 ± 0.80	a	206.480 ± 0.040	8.657 ± 0.006	a
S	g	276.98 ± 0.25	c	167.715 ± 0.035	6.657 ± 0.004	c
S ₂	g	128.49 ± 0.30	c	228.055 ± 0.050	9.131 ± 0.008	c
SO ₂	g	-296.81 ± 0.20	c	248.11 ± 0.06	10.548 ± 0.013	c
N	g	472.68 ± 0.40	a	153.189 ± 0.020	6.197 ± 0.002	a
N ₂	g	0	b	191.502 ± 0.025	8.669 ± 0.003	a
NO ₃ ⁻	aq	-----	c	146.94 ± 0.85	-----	c
NH ₃	g	-45.94 ± 0.35	c	192.67 ± 0.08	10.046 ± 0.008	c
NH ₄ ⁺	aq	-133.26 ± 0.25	c	111.17 ± 0.75	-----	c
C	c	0	b	5.74 ± 0.12	1.050 ± 0.020	a
C	g	716.67 ± 0.44	a	157.988 ± 0.020	6.535 ± 0.006	a
CO	g	-110.53 ± 0.17	a	197.556 ± 0.032	8.673 ± 0.008	a
CO ₂	g	-393.51 ± 0.13	a	213.677 ± 0.040	9.364 ± 0.008	a
Si	c	0	b	18.81 ± 0.08	3.217 ± 0.008	k
Si	g	450 ± 8	l	167.870 ± 0.035	7.550 ± 0.004	m
SiO ₂	c, α-quartz	-910.7 ± 1.0	n	41.46 ± 0.20	6.916 ± 0.020	o
SiF ₄	g	-1614.95 ± 0.85	n	282.65 ± 0.40	15.36 ± 0.05	p
B	c	0	b	5.90 ± 0.08	1.222 ± 0.008	q
B	g	560 ± 12	r	153.325 ± 0.035	6.315 ± 0.004	s
B ₂ O ₃	c	-1273.5 ± 1.4	t	53.97 ± 0.30	9.301 ± 0.040	u
BF ₃	g	-1135.95 ± 0.80	t	254.31 ± 0.10	11.65 ± 0.010	v
Al	c	0	b	28.35 ± 0.08	4.565 ± 0.010	w
Al	g	329.7 ± 4.0	x	164.440 ± 0.030	6.919 ± 0.004	y
Al ₂ O ₃	c, α-corundum	-1675.7 ± 1.3	z	50.92 ± 0.10	10.016 ± 0.020	aa
Zn	c	0	b	41.63 ± 0.13	5.657 ± 0.020	c
Zn	g	130.42 ± 0.20	c	160.875 ± 0.025	6.197 ± 0.004	c
Zn ⁺²	aq	-153.39 ± 0.20	ab	-109.6 ± 0.7	-----	ac
ZnO	c	-350.46 ± 0.27	ad	43.64 ± 0.40	6.933 ± 0.040	ae
Cu	c	0	b	33.15 ± 0.08	5.004 ± 0.008	af
Cu	g	337.6 ± 1.2	ag	166.285 ± 0.025	6.197 ± 0.004	ah
Ag	c	0	b	42.55 ± 0.21	5.745 ± 0.020	c
Ag ₂	g	284.9 ± 0.8	c	172.883 ± 0.025	6.197 ± 0.004	c
Ag ⁺	aq	105.750 ± 0.085	c	73.38 ± 0.40	-----	c
AgCl	c	-127.070 ± 0.085	c	96.23 ± 0.20	12.033 ± 0.040	c
Li	c	0	b	29.12 ± 0.20	4.632 ± 0.040	c
Li ⁺	aq	-278.455 ± 0.090	c	11.30 ± 0.35	-----	c
Na	c	0	b	51.30 ± 0.20	6.460 ± 0.020	c
Na ⁺	aq	-240.300 ± 0.065	c	58.41 ± 0.20	-----	c
K	c	0	b	64.68 ± 0.20	7.088 ± 0.020	c
K ⁺	aq	-252.17 ± 0.10	c	101.04 ± 0.25	-----	c
Rb	c	0	b	76.78 ± 0.30	7.489 ± 0.020	c
Rb ⁺	aq	-251.12 ± 0.13	c	120.46 ± 0.40	-----	c
Cs	c	0	b	85.23 ± 0.40	7.711 ± 0.020	c
Cs ⁺	aq	-258.04 ± 0.13	c	152.84 ± 0.40	-----	c

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CODATA Tentative Set of Key Values for Thermodynamics

Substance	State	$\Delta H^{\circ}f(298.15\text{ K})$	Foot- note	$S^{\circ}(298.15\text{ K})$		$H^{\circ}(298.15\text{ K}) -$	Foot- note
		kJ mol^{-1}		$\text{J K}^{-1} \text{ mol}^{-1}$		$\frac{H^{\circ}(O)}{H^{\circ}(O)}$ kJ mol^{-1}	
S	c, rhombic	0	a	31.80	± 0.21	4.410 ± 0.035	b
SO ₄ ⁻²	aq	-909.60 ± 0.40	c	18.83	± 0.50	-----	d
P	c, white	0	e	41.09	± 0.25	5.360 ± 0.015	f
P	g	316.4 ± 1.5	g	163.086	± 0.020	6.197 ± 0.005	h
P ₂	g	143.8 ± 3	i	217.984	± 0.040	8.900 ± 0.008	j
P ₄	g	59.10 ± 0.30	k	279.71	± 0.50	14.10 ± 0.24	l
P ₄ O ₁₀	c, hexag.	-3009.8 ± 1.0	m	231.0	± 0.8	34.22 ± 0.05	n
AlF ₃ ⁺²	c	-1510.4 ± 1.3	o	66.5	± 0.4	11.62 ± 0.04	p
Cu ⁺²	aq	65.69 ± 0.80	q	-97.1	± 1.2	-----	r
CuSO ₄	c	-771.1 ± 1.2	r	109.2	± 0.4	16.86 ± 0.08	s
Th	c	0	a	53.39	± 0.40	6.510 ± 0.020	t
Th	g	598 ± 6	u	190.06	± 0.04	6.197 ± 0.005	v
ThO ₂	c	-1226.4 ± 3.5	w	65.23	± 0.20	10.560 ± 0.020	x
U	c	0	a	50.20	± 0.20	6.364 ± 0.020	y
U	g	536 ± 8	z	199.68	± 0.04	6.500 ± 0.005	aa
UO ₂	c	-1085.0 ± 1.0	ab	77.03	± 0.20	11.280 ± 0.020	ac
UO ₂ ⁺²	aq	-1019.2 ± 2.5	ad	-98.3	± 4.0	-----	ae
UO ₃	c, γ	-1223.8 ± 2.0	af	98.62	± 0.40	15.10 ± 0.08	ag
U ₃ O ₈	c	-3574.8 ± 2.5	ah	282.55	± 0.50	42.74 ± 0.10	ai
Be	c	0	a	9.50	± 0.08	1.950 ± 0.020	aj
Be	g	324 ± 5	ak	136.165	± 0.020	6.197 ± 0.004	al
BeO	c	-609.4 ± 2.5	am	13.77	± 0.04	2.837 ± 0.008	an
Mg	c	0	a	32.68	± 0.10	5.000 ± 0.030	ao
Mg	g	147.10 ± 0.80	ap	148.535	± 0.020	6.197 ± 0.004	aq
Mg ⁺²	aq	-467.3 ± 0.8	ar	-137	± 4	-----	as
MgO	c	-601.5 ± 0.3	at	26.95	± 0.15	5.160 ± 0.020	au
MgF ₂	c	-1124.2 ± 1.2	av	57.2	± 0.4	9.92 ± 0.06	aw
Ca	c	0	a	41.6	± 0.4	5.73 ± 0.04	ax
Ca	g	177.8 ± 0.8	ay	154.775	± 0.020	6.197 ± 0.004	az
Ca ⁺²	aq	-542.7 ± 1.2	ba	-53.5	± 2.0	-----	bb
CaO	c	-635.09 ± 0.90	bc	38.1	± 0.4	6.75 ± 0.06	bd

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