
SECTION 6

THERMODYNAMIC PROPERTIES

6.1	ENTHALPIES AND GIBBS ENERGIES OF FORMATION, ENTROPIES, AND HEAT CAPACITIES	6.1
6.1.1	Some Thermodynamic Relations	6.2
Table 6.1	Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of Organic Compounds	6.5
Table 6.2	Heats of Fusion, Vaporization, and Sublimation and Specific Heat at Various Temperatures of Organic Compounds	6.51
Table 6.3	Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of the Elements and Inorganic Compounds	6.81
Table 6.4	Heats of Fusion, Vaporization, and Sublimation and Specific Heat at Various Temperatures of the Elements and Inorganic Compounds	6.124
6.2	CRITICAL PHENOMENA	6.142
Table 6.5	Critical Properties	6.143

6.1 ENTHALPIES AND GIBBS ENERGIES OF FORMATION, ENTROPIES, AND HEAT CAPACITIES

The tables in this section contain values of the enthalpy and Gibbs energy of formation, entropy, and heat capacity at 298.15 K (25°C). No values are given in these tables for metal alloys or other solid solutions, for fused salts, or for substances of undefined chemical composition.

The physical state of each substance is indicated in the column headed “State” as crystalline solid (c), liquid (lq), or gaseous (g). Solutions in water are listed as aqueous (aq).

The values of the thermodynamic properties of the pure substances given in these tables are, for the substances in their standard states, defined as follows: For a pure solid or liquid, the standard state is the substance in the condensed phase under a pressure of 1 atm (101 325 Pa). For a gas, the standard state is the hypothetical ideal gas at unit fugacity, in which state the enthalpy is that of the real gas at the same temperature and at zero pressure.

The values of $\Delta_f H^\circ$ and $\Delta_f G^\circ$ that are given in the tables represent the change in the appropriate thermodynamic quantity when one mole of the substance in its standard state is formed, isothermally at the indicated temperature, from the elements, each in its appropriate standard reference state. The standard reference state at 25°C for each element has been chosen to be the standard state that is thermodynamically stable at 25°C and 1 atm pressure. The standard reference states are indicated in the tables by the fact that the values of $\Delta_f H^\circ$ and $\Delta_f G^\circ$ are exactly zero.

The values of S° represent the virtual or “thermal” entropy of the substance in the standard state at 298.15 K (25°C), omitting contributions from nuclear spins. Isotope mixing effects are also excluded except in the case of the ^1H — ^2H system.

Solutions in water are designated as aqueous, and the concentration of the solution is expressed in terms of the number of moles of solvent associated with 1 mol of the solute. If no concentration is indicated, the solution is assumed to be dilute. The standard state for a solute in aqueous solution is taken as the hypothetical ideal solution of unit molality (indicated as std. state or ss). In this state

the partial molal enthalpy and the heat capacity of the solute are the same as in the infinitely dilute real solution.

For some tables the uncertainty of entries is indicated within parentheses immediately following the value; viz., an entry 34.5(4) implies 34.5 ± 0.4 and an entry 34.5(12) implies 34.5 ± 1.2 .

References: D. D. Wagman, et al., *The NBS Tables of Chemical Thermodynamic Properties*, in *J. Phys. Chem. Ref. Data*, **11**: 2, 1982; M. W. Chase, et al., *JANAF Thermochemical Tables*, 3rd ed., American Chemical Society and the American Institute of Physics, 1986 (supplements to JANAF appear in *J. Phys. Chem. Ref. Data*); Thermodynamic Research Center, *TRC Thermochemical Tables*, Texas A&M University, College Station, Texas; I. Barin and O. Knacke, *Thermochemical Properties of Inorganic Substances*, Springer-Verlag, Berlin, 1973; J. B. Pedley, R. D. Naylor, and S. P. Kirby, *Thermochemical Data of Organic Compounds*, 2nd ed., Chapman and Hall, London, 1986; V. Majer and V. Svoboda, *Enthalpies of Vaporization of Organic Compounds*, International Union of Pure and Applied Chemistry, Chemical Data Series No. 32, Blackwell, Oxford, 1985.

6.1.1 Some Thermodynamic Relations

6.1.1.1 Enthalpy of Formation. Once standard enthalpies are assigned to the elements, it is possible to determine standard enthalpies for compounds. For the reaction:

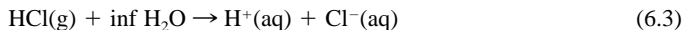


Since the elements are in their standard states, the enthalpy change for the reaction is equal to the standard enthalpy of CO_2 less the standard enthalpies of C and O_2 , which are zero in each instance. Thus,

$$\Delta_f H^\circ = -393.51 - 0 - 0 = -393.51 \text{ kJ} \quad (6.2)$$

Tables of enthalpies, such as Tables 6.1 and 6.3, can be used to determine the enthalpy for any reaction at 1 atm and 298.15 K involving the elements and any of the compounds appearing in the tables.

The solution of 1 mole of HCl gas in a large amount of water (infinitely dilute real solution) is represented by:



The heat evolved in the reaction is $\Delta H^\circ = -74.84 \text{ kJ}$. With the value of $\Delta_f H^\circ$ from Table 6.3, one has for the reaction:

$$\Delta_f H^\circ = \Delta_f H^\circ[\text{H}^+(\text{aq})] + \Delta_f H^\circ[\text{Cl}^-(\text{aq})] - \Delta_f H^\circ[\text{HCl}(\text{g})] \quad (6.4)$$

for the standard enthalpy of formation of the pair of ions H^+ and Cl^- in aqueous solution (standard state, $m = 1$). To obtain the $\Delta_f H^\circ$ values for individual ions, the enthalpy of formation of $\text{H}^+(\text{aq})$ is arbitrarily assigned the value zero at 298.15 K. Thus, from Eq. (6.4):

$$\Delta_f H^\circ[\text{Cl}^-(\text{aq})] = -74.84 + (-92.31) = -167.15 \text{ kJ}$$

With similar data from Tables 6.1 and 6.3, the enthalpies of formation of other ions can be determined. Thus, from the $\Delta_f H^\circ[\text{KCl}(\text{aq, std. state, } m = 1 \text{ or aq, ss})]$ of -419.53 kJ and the foregoing value for $\Delta_f H^\circ[\text{Cl}^-(\text{aq, ss})]$:

$$\begin{aligned} \Delta_f H^\circ[\text{K}^+(\text{aq, ss})] &= \Delta_f H^\circ[\text{KCl}(\text{aq, ss})] - \Delta_f H^\circ[\text{Cl}^-(\text{aq, ss})] \\ &= -419.53 - (-167.15) = -252.38 \text{ kJ} \end{aligned} \quad (6.5)$$

6.1.1.2 Enthalpy of Vaporization (or Sublimation) When the pressure of the vapor in equilibrium with a liquid reaches 1 atm, the liquid boils and is completely converted to vapor on absorption of the enthalpy of vaporization ΔH_v at the normal boiling point T_b . A rough empirical relationship between the normal boiling point and the enthalpy of vaporization (*Trouton's rule*) is:

$$\frac{\Delta H_v}{T_b} = 88 \text{ J} \cdot \text{mol}^{-1} \cdot \text{K}^{-1} \quad (6.6)$$

It is best applied to nonpolar liquids which form unassociated vapors.

To a first approximation, the enthalpy of sublimation ΔH_s at constant temperature is:

$$\Delta H_s = \Delta H_m + \Delta H_v \quad (6.7)$$

where ΔH_m is the enthalpy of melting.

The *Clapeyron* equation expresses the dynamic equilibrium existing between the vapor and the condensed phase of a pure substance:

$$\frac{dP}{dT} = \frac{\Delta H_v}{T\Delta V} \quad (6.8)$$

where ΔV is the volume increment between the vapor phase and the condensed phase. If the condensed phase is solid, the enthalpy increment is that of sublimation.

Substitution of $V = RT/P$ into the foregoing equation and rearranging gives the *Clausius-Clapeyron* equation,

$$\frac{dP}{P dT} = \frac{\Delta H_v}{RT^2} \quad (6.9)$$

or

$$\Delta H_v = -R \frac{d(\ln P)}{1/T} \quad (6.10)$$

which may be used for calculating the enthalpy of vaporization of any compound provided its boiling point at any pressure is known. If an Antoine equation is available (such as Eq. (5.1), page 5.30), differentiation and insertion into the foregoing equation gives:

$$\Delta H_v = \frac{4.5757T^2B}{(T + C - 273.15)^2} \quad (6.11)$$

Inclusion of a compressibility factor into the foregoing equation, as suggested by the *Haggmacher* equation improves the estimate of ΔH_v :

$$\Delta H_v = \frac{RT^2}{P} \left(\frac{dP}{dT} \right) \left(1 - \frac{T_c^3 P}{T^3 P_c} \right)^{1/2} \quad (6.12)$$

where T_c and P_c are critical constants (Table 6.5). Although critical constants may be unknown, the compressibility factor is very nearly constant for all compounds belonging to the same family, and an estimate can be deduced from a related compound whose critical constants are available.

6.1.1.3 Heat Capacity (or Specific Heat) The temperature dependence of the heat capacity is complex. If the temperature range is restricted, the heat capacity of any phase may be represented adequately by an expression such as:

$$C_p = a + bT + cT^2 \quad (6.13)$$

in which a , b , and c are empirical constants. These constants may be evaluated by taking three pieces of data: $(T_1, C_{p,1})$, $(T_2, C_{p,2})$, and $(T_3, C_{p,1})$, and substituting in the following expressions:

$$\frac{C_{p,1}}{(T_1 - T_2)(T_1 - T_3)} + \frac{C_{p,2}}{(T_2 - T_1)(T_2 - T_3)} + \frac{C_{p,3}}{(T_3 - T_2)(T_3 - T_1)} = c \quad (6.14)$$

$$\frac{C_{p,1} - C_{p,2}}{T_1 - T_2} - [(T_1 + T_2)c] = b \quad (6.15)$$

$$(C_{p,1} - bT_1) - cT_1^2 = a \quad (6.16)$$

Smoothed data presented at rounded temperatures, such as are available in Tables 6.2 and 6.4, plus the C_p° values at 298 K listed in Table 6.1 and 6.3, are especially suitable for substitution in the foregoing parabolic equations. The use of such a parabolic fit is appropriate for interpolation, but data extrapolated outside the original temperature range should not be sought.

6.1.1.4 Enthalpy of a System The enthalpy increment of a system over the interval of temperature from T_1 to T_2 , under the constraint of constant pressure, is given by the expression:

$$H_2 - H_1 = \int_{T_1}^{T_2} C_p dT \quad (6.17)$$

The enthalpy over a temperature range that includes phase transitions, melting, and vaporization, is represented by:

$$\begin{aligned} H_2 - H_1 = & \int_{T_1}^{T_2} C_p(c, \text{II}) dT + \Delta H_t + \int_{T_1}^{T_m} C_p(c, \text{I}) dT + \Delta H_m \\ & + \int_{T_m}^{T_b} C_p(1q) dT + \Delta H_v + \int_{T_b}^{T_2} C_p(g) dT \end{aligned} \quad (6.18)$$

Integration of heat capacities, as expressed by Eq. (6.13), leads to:

$$\Delta H = a(T_2 - T_1) + \frac{b(T_2^2 - T_1^2)}{2} + \frac{c(T_2^3 - T_1^3)}{3} \quad (6.19)$$

6.1.1.5 Entropy In the physical change of state,

$$\Delta S_m = \frac{\Delta H_m}{T_m} \quad (6.20)$$

is the entropy of melting (or fusion),

$$\Delta S_v = \frac{\Delta H_v}{T_b} \quad (6.21)$$

is the entropy of vaporization, and

$$\Delta S_s = \frac{\Delta H_s}{T_s} \quad (6.22)$$

is the entropy of sublimation.

A general expression for the entropy of a system, involving any phase transitions, is

$$S_2 - S_1 = \int_{T_1}^{T_i} \frac{C_p(c, \text{II}) dT}{T} + \frac{\Delta H_t}{T} + \int_{T_b}^{T_m} \frac{C_p(c, \text{I}) dT}{T} + \frac{\Delta H_m}{T} \\ + \int_{T_m}^{T_b} \frac{C_p(\text{lq}) dT}{T} + \frac{\Delta H_v}{T} + \int_{T_b}^{T_m} \frac{C_p(\text{g}) dT}{T} \quad (6.23)$$

If C_p is independent of temperature,

$$\Delta S = C_p (\ln T_2 - \ln T_1) = 2.303 C_p \log \frac{T_2}{T_1} \quad (6.24)$$

If the heat capacities change with temperature, an empirical equation like Eq. (6.13) may be inserted in Eq. (6.23) before integration. Usually the integration is performed graphically from a plot of either C_p/T versus T or C_p versus $\ln T$.

TABLE 6.1 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of Organic Compounds

Substance	Physical State	$\Delta_f H^\circ$ kJ·mol ⁻¹	$\Delta_f G^\circ$ kJ·mol ⁻¹	S° J·deg ⁻¹ ·mol ⁻¹	C_p° J·deg ⁻¹ ·mol ⁻¹
Acenaphthene	c	70.34		188.9	190.4
Acenaphthylene	c	186.7			166.4
Acetaldehyde	lq	-192.2	-127.6	160.4	89.0
	g	-166.1	-133.0	263.8	55.3
Acetaldoxime	c	-77.9			
	lq	-81.6			
Acetamide	c	-317.0		115.0	91.3
Acetamidoguanidine nitrate	c	-494.0			
1-Acetamido-2-nitroguanidine	c	-193.6			
5-Acetamidotetrazole	c	-5.0			
Acetanilide	c	-210.6			
Acetic acid	lq	-484.4	-390.2	159.9	123.6
	g	-432.2	-374.2	283.5	63.4
ionized; std. state, $m = 1$	aq	-486.34	-369.65	86.7	-6.3
Acetic anhydride	lq	-624.4	-489.14	268.8	168.2 ³⁰
Acetone	lq	-248.4	-152.7	198.8	126.3
	g	-217.1	-152.7	295.3	74.5
Acetonitrile	lq	31.4	86.5	149.7	91.5
	g	74.0	91.9	243.4	52.2
Acetophenone	lq	-142.5	-17.0	249.6	204.6
Acetyl bromide	lq	-223.5			
Acetyl chloride	lq	-272.9	-208.2	201.0	117.0
	g	-242.8	-205.8	295.1	67.8
Acetylene	g	227.4	209.0	201.0	44.1
Acetylene- d_2	g	221.5	205.9	208.9	49.3
Acetylenedicarboxylic acid	c	-578.2			
Acetyl fluoride	g	-442.1			
1-Acetylimidazole	c	-574.0			
Acetyl iodide	lq	-163.5			
Acridine	c	179.4			
Adamantane	c	-194.1			

TABLE 6.1 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of Organic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ·mol ⁻¹	$\Delta_f G^\circ$ kJ·mol ⁻¹	S° J·deg ⁻¹ ·mol ⁻¹	C_p° J·deg ⁻¹ ·mol ⁻¹
Adenine	c	96.0	299.6	151.1	147.0
(+)-Alanine	c	-561.2	-369.4	132.3	
(-)-Alanine	c	-604.0	-370.5	129.3	
(±)-Alanine	c	-563.6	-372.3	132.3	
β-Alanine	c	-558.0			
(±)-N-Alanylglycine	c	-777.8	-489.9	213.5	
(-)-Alanylglycine	c	-827.0	-533.0	195.2	
Allene	g	190.5			
Alloxan monohydrate	c	-1000.7	-762.3	186.7	
Allylamine	lq	-10.0			
Allyl <i>tert</i> -butyl sulfide	lq	-91.0			
Allyl ethyl sulfone	lq	-406.0			
Allyl methyl sulfone	lq	-385.1			
Allyl trichloroacetate	lq	-395.3			
Allyl (<i>see</i> Propene)					
Aminotrimethylboron	c	-284.1	-79.3	218.0	
3-Aminoacetophenone	c	-173.3			
4-Aminoacetophenone	c	-182.1			
2-Aminoacridine	c	166.4			
9-Aminoacridine	c	159.2			
2-Aminobenzoic acid	c	-400.9			
3-Aminobenzoic acid	c	-411.6			
4-Aminobenzoic acid	c	-412.9			
2-Aminobiphenyl	c	112.2			
4-Aminobiphenyl	c	81.2			
4-Aminobutanoic acid	c	-581.0			
2-Aminoethanesulfonic acid	c	-785.9	-562.3	154.1	140.7
ionized; std. state, <i>m</i> = 1	aq	-719.8	-509.8	200.1	
2-Aminoethanol	lq				195.5
2-Aminohexanoic acid	c	-639.1			
(norleucine)					
4-Aminohexanoic acid	c	-646.2			
5-Aminohexanoic acid	c	-643.3			
6-Aminohexanoic acid	c	-639.1			
(-)-2-Amino-3-hydroxy-	c	-759.5			
butanoic acid					
2-Amino-2-(hydroxymethyl)-	c	717.8			
1,1-propanediol					
3-Aminonitroguanidine	c	22.1			
5-Aminopentanoic acid	c	-604.1			
5-Aminotetrazole	c	-207.8			
3-Amino-1,2,4-triazole	c	76.8			
Aniline	lq	31.3	149.2	191.4	191.9
	g	87.5	-7.0	317.9	107.9
Anthracene	c	129.2	286.0	207.6	210.5
9,10-Anthraquinone	c	-207.5			
D-(-)-Arabinose [also (+)-]	c	-1057.9			
(+)-Arginine	c	-623.5	-240.5	250.8	232.0
L-(+)-Ascorbic acid	c	-1164.6			
L-(+)-Asparagine	c	-789.4	-530.6	174.6	
L-(+)-Aspartic acid	c	-973.3	-730.7	170.2	

TABLE 6.1 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of Organic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ·mol ⁻¹	$\Delta_f G^\circ$ kJ·mol ⁻¹	S° J·deg ⁻¹ ·mol ⁻¹	C_p° J·deg ⁻¹ ·mol ⁻¹
<i>cis</i> -Azobenzene	c	310.2			
<i>trans</i> -Azobenzene	c	365.2			
Azoisopropane	g	35.8			
Azomethane	g	148.8	239.7	289.9	78.0
Azomethane- <i>d</i> ₆	g	119.3	218.3	305.7	90.6
Azopropane	g	51.5			
Azulene	g	289.1	353.4	338.1	128.5
Barbituric acid	c	-637.2			
Benzaldehyde	lq	-87.0	9.4		172.0
Benzamide	c	-202.6			
Benzanilide	c	-93.4			
1,2-Benzanthracene	c	170.9			
2,3-Benzanthracene	c	160.4	359.2	215.5	
1,2-Benzanthracene-9,10-dione	c	-231.9			
Benzene	lq	49.0	124.4	173.4	136.0
	g	82.6	129.7	269.2	82.4
Benzeneboronic acid	c	-720.1			
1,2-Benzenediamine	c	-0.3			
1,3-Benzenediamine	c	-7.8			
1,4-Benzenediamine	c	3.1			
1,3-Benzenedicarboxylic acid	c	803.0			
1,4-Benzenedicarboxylic acid	c	816.1			
1,2,4,5-Benzenetetra-carboxylic acid	c	1571.0			
Benzenethiol (thiophenol)	lq	63.7	134.0	222.8	173.2
	g	111.3	147.6	336.9	104.9
1,2,3-Benzenetricarboxylic acid	c	-1160.0			
1,2,4-Benzenetricarboxylic acid	c	-1179.0			
1,3,5-Benzenetricarboxylic acid	c	-1190.0			
1,2,3-Benzenetriol	c	-551.1			
1,2,4-Benzenetriol	c	-563.8			
1,3,5-Benzenetriol	c	-584.6			
<i>p</i> -Benzidine	c	70.7			
Benzil	c	-153.9			
Benzoic acid	c	-385.2	-245.3	167.6	146.8
Benzoic anhydride	c	-415.4			
Benzonitrile	lq	163.2		209.1	165.2
	g	215.8	260.8	321.0	109.1
Benzo[<i>def</i>]phenanthrene	c	125.5	269.5	224.8	236.0
Benzophenone	c	-34.5	140.2	245.2	224.8
Benzo[<i>f</i>]quinoline	c	150.6			
Benzo[<i>h</i>]quinoline	c	149.7			
1,4-Benzoquinone	c	-185.7	-83.6	162.8	129.0
Benzo[<i>b</i>]thiophene	c	100.6			
1,2,3-Benzotriazole	c	250.0			
Benzotrifluoride	lq	-636.7			
Benzoyl bromide	lq	-107.3			
Benzoyl chloride	lq	-158.0			
Benzoylformic acid	c	-482.4			
<i>N</i> -Benzoylglycine	c	-609.8	-369.57	239.3	

TABLE 6.1 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of Organic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ·mol ⁻¹	$\Delta_f G^\circ$ kJ·mol ⁻¹	S° J·deg ⁻¹ ·mol ⁻¹	C_p° J·deg ⁻¹ ·mol ⁻¹
Benzoyl iodide	lq	-53.5			
3,4-Benzphenanthrene	c	184.9			
Benzylamine	lq	34.2			
Benzyl alcohol	lq	-160.7	-27.5	216.7	218.0
Benzyl bromide	lq	16.0			
Benzyl chloride	lq	-32.6			182.4
N-Benzyl diphenylamine	c	184.7			
Benzyl ethyl sulfide	lq	-4.9			
Benzyl iodide	lq	57.3			
Benzyl methyl ketone	lq	-151.9			
Benzyl methyl sulfide	lq	26.2			
Bicyclo[1.1.0]butane	g	217.1			
Bicyclo[2.2.1]hepta-2,5-dione	lq	213.0			
Bicyclo[2.2.1]heptane	c	-95.1			
Bicyclo[4.1.0]heptane	lq	-36.7			
Bicyclo[2.2.1]heptene	lq	90.0	203.9		130.0
Bicyclo[3.1.0]hexane	g	38.6			
Bicyclohexyl	lq	-273.7			
Bicyclo[2.2.2]octane	c	-146.9			
Bicyclo[4.2.0]octane	g	-26.2			
Bicyclo[5.1.0]octane	g	-16.6			
Bicyclo[2.2.2]oct-2-ene	g	-23.3			
Bicyclopropyl	g	129.3			
Biphenyl	c	99.4	254.2	209.4	198.4
2-Biphenylcarboxylic acid	c	-349.0			
(1,1'-Biphenyl)-4,4'-diamine	c	70.7			
Biphenylene	c	334.0			
Bis(2-chloroethyl) ether	lq				220.9
Bis(dimethylthiocarbonyl) disulfide	c	41.6			
Bis(2-hydroxyethyl) ether	lq	-1621.0		441.0	135.1
	g	-571.1			
Bromoacetone	g	-181.0			
Bromoacetylene	g			253.7	55.7
Bromobenzene	lq	60.9	126.0	219.2	154.3
4-Bromobenzoic acid	c	-378.3			
1-Bromobutane	lq	-143.8	-12.9	369.8	109.3
2-Bromobutane	lq	-154.8	-19.25		
	g	-120.3	-25.8	370.3	110.8
Bromochlorodifluoromethane	g	-471.5	-448.4	318.5	74.6
1-Bromo-2-chloroethane	lq				130.1 ²⁷
Bromochlorofluoromethane	g	-295.0	-278.6	304.3	63.2
Bromochloromethane	lq				52.7
	g	-50.2	-39.3	287.6	
1-Bromo-2-chloro-1,1,2-trifluoroethane	g	-644.8			
2-Bromo-2-chloro-1,1,1-trifluoroethane	g	-690.4			
1-Bromodecane	lq	-344.7			

TABLE 6.1 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of Organic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ·mol ⁻¹	$\Delta_f G^\circ$ kJ·mol ⁻¹	S° J·deg ⁻¹ ·mol ⁻¹	C_p° J·deg ⁻¹ ·mol ⁻¹
Bromodichlorofluoromethane	g	-269.5	-246.8	330.6	80.0
Bromodichloromethane	g	-58.6	-42.5	316.4	67.4
Bromodifluoromethane	g	-424.9	-447.3	295.1	58.7
Bromoethane	lq	-90.5	-25.8	198.7	100.8
Bromoethylene (vinyl bromide)	g	-61.9	-23.9	286.7	64.5
	lq				107.7 ¹⁵
Bromofluoromethane	g	79.2	81.7	275.8	55.4
	g	-252.7	-241.5	276.3	49.2
1-Bromoheptane	lq	-218.4			
1-Bromohexane	lq	-194.2		453.0	203.5
Bromiodomethane	g	50.2	39.2	307.5	
Bromomethane	lq				78.7 ⁷
	g	-35.4	-26.3	246.4	42.5
2-Bromo-2-methylpropane	lq	-163.8			151.0
	g	-132.4	-28.2	332.0	116.5
1-Bromooctane	lq	-245.1			
Bromopentafluoroethane	g	-1064.4			
1-Bromopentane	lq	-170.2			132.2
	g	-129.0	-5.7	408.8	
1-Bromopropane	lq	-121.8			86.4
	g	-87.0	-22.5	330.9	
2-Bromopropane	lq	-130.5			132.2
	g	-99.4	-27.2	316.2	89.4
<i>cis</i> -1-Bromopropene	g	40.8			
3-Bromopropene	g	45.2			
<i>N</i> -Bromosuccinimide	c	-335.9			
α -Bromotoluene	lq	23.4			
Bromotrichloromethane	g	-41.1	-12.4	332.8	85.3
Bromotrifluoroethane	g	-694.5			
Bromotrifluoromethane	g	-648.3	-622.6	297.8(5)	69.3
Bromotrimethylsilane	lq	-325.9			
Bromotrinitromethane	g	80.3			
Brucine	c	-496.2			
1,2-Butadiene	g	162.3	199.5	293.0	80.1
1,3-Butadiene	lq	88.5		199.0	123.6
	g	110.0	150.7	278.7	79.5
1,3-Butadiyne	g	472.8	444.0	250.0	73.6
Butanal	lq	-239.2			163.7
	g	-204.9	-114.8	243.7	103.4
Butanamide	lq	-346.9			
Butane	lq				104.5 ^{-0.5}
	g	-125.6	-17.2	310.1	97.5
1,2-Butanediamine	lq	-120.2			
(\pm)-1,2-Butanediol	lq	-523.6			
1,3-Butanediol	lq	-501.0			227.2 ³⁰
1,4-Butanediol	lq	-503.3		223.4	200.1
2,3-Butanediol	lq	-541.5			213.0
Butanedinitrile	c	139.7			
	lq				160.5 ⁶²
2,3-Butanedione	lq	-365.8			
1,4-Butanedithiol	lq	-105.7			

TABLE 6.1 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of Organic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ·mol ⁻¹	$\Delta_f G^\circ$ kJ·mol ⁻¹	S° J·deg ⁻¹ ·mol ⁻¹	C_p° J·deg ⁻¹ ·mol ⁻¹
Butanenitrile	lq	-5.8			159 ⁶⁷
	g	33.6	108.7	325.4	97.0
1-Butanethiol	lq	-124.7	4.1	276.0	171.2
2-Butanethiol	lq	-131.0	-0.17	271.4	
Butanoic acid	lq	-533.8	-377.7	222.2	178.6
Butanoic anhydride	lq				283.7
1-Butanol	lq	-327.3	-162.5	225.8	177.0
	g	-275.0	-150.8	362.8	122.6
(±)-2-Butanol	lq	-342.6	-177.0	214.9	196.9
	g	-292.9	-167.6	359.5	113.3
2-Butanone	lq	-273.3	-151.4	239.1	158.9
	g	-238.5		339.9	101.7
Butanophenone	lq	-188.9			
trans-2-Butenal	lq	-138.7			95.4
cis-Butenedinitrile	c	268.2			
1-Butene	lq	-20.8		227.0	118.0
	g	0.1	71.3	305.6	85.7
cis-2-Butene	lq	-29.8		219.9	127.0
	g	-7.1	65.9	300.8	78.9
trans-2-Butene	g	-11.4	63.0	296.5	87.8
cis-2-Butenenitrile	lq	95.1			
trans-2-Butenenitrile	lq	95.1			
3-Butenenitrile	g	159.7	193.4	298.4	82.1
cis-2-Butenoic acid	lq	-347.0			
trans-2-Butenoic acid	c	-430.5			
cis-2-Butenedioic acid	c	-788.7			
trans-2-Butenedioic acid	c	-811.1			
1-Buten-3-yne	g	304.6	306.0	279.4	73.2
2-Butoxyethanol	lq				281.0
N-Butylacetamide	lq	-380.8			
Butyl acetate	lq	-529.2			227.8
Butylamine	lq	-127.7			179.2
	g	-92.0	49.2	363.3	118.6
sec-Butylamine	lq	-137.5			
	g	-104.6	40.7	351.3	117.2
tert-Butylamine	g	-150.6			192.1
	g	-121.0	28.9	337.9	120.0
Butylbenzene	lq	63.2			243.4
	g	-13.1	144.7	439.5	416.3
sec-Butylbenzene	lq	-66.4			
tert-Butylbenzene	lq	-70.7			238.0
sec-Butyl butanoate	lq	-492.6			
Butyl chloroacetate	lq	-538.4			
Butyl 2-chlorobutanoate	lq	-655.2			
Butyl 3-chlorobutanoate	lq	-610.9			
Butyl 4-chlorobutanoate	lq	-618.0			
Butyl 2-chloropropanoate	lq	-572.0			
Butyl 3-chloropropanoate	lq	-558.2			
Butyl crotonate	lq	-467.8			
Butylcyclohexane	lq	-263.1		345.0	271.0
	g	-213.4	56.4	458.5	207.1

TABLE 6.1 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of Organic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ·mol ⁻¹	$\Delta_f G^\circ$ kJ·mol ⁻¹	S° J·deg ⁻¹ ·mol ⁻¹	C_p° J·deg ⁻¹ ·mol ⁻¹
Butylcyclopentane	g	-168.3	61.4	456.2	177.5
Butyl dichloroacetate	lq	-550.2			
Butyl ethyl ether	lq				159.0
Butyl ethyl sulfide	g	-125.2	32.0	453.0	162.0
(3-thiaheptane)					
<i>tert</i> -Butyl ethyl sulfide	lq	-187.3			
Butyl formate	lq				200.2
<i>tert</i> -Butyl hydroperoxide	lq	-293.6			
Butyllithium	lq	-132.2			
Butyl methyl ether	lq	-290.6		295.3	192.7
<i>tert</i> -Butyl methyl ether	lq	-313.6		265.3	187.5
Butyl methyl sulfide	lq	-142.8	17.1	307.5	200.9
(2-thiahexane)					
<i>tert</i> -Butyl methyl sulfide	lq	-156.9		276.1	199.9
Butyl methyl sulfone	lq	-535.8			
<i>tert</i> -Butyl methyl sulfone	c	-556.0			
<i>cis</i> -Butyl 9-octadecanoate	lq	-816.9			
<i>tert</i> -Butyl peroxide	lq	-380.9			
Butyl trichloroacetate	lq	-545.8			
Butylurea	c	-419.5			
Butyl vinyl ether	lq	-218.8			232.0
1-Butyne	g	165.2	202.1	290.8	81.4
2-Butyne	g	145.7	185.4	283.3	78.0
2-Butynedinitrile	g	529.2			
2-Butynedioic acid	c	-577.4			
3-Butynoic acid	c	-241.8			
γ -Butyrolactone	lq	-420.9			141.4
(+)-Camphor	c	-319.4			271.2
ϵ -Caprolactam	c	-329.4			
9 <i>H</i> -Carbazole	c	101.7			
Carbonyl bromide	g	-96.2	-110.9	309.1	61.8
Carbonyl chloride	g	-219.1	-204.9	283.5	57.7
Carbonyl chloride fluoride	g			276.7	52.4
Carbonyl fluoride	g	-639.8			46.8
Chloroacetamide	c	-338.5			
Chloroacetic acid	c	-510.5			
Chloroacetyl chloride	lq	-283.7			
Chloroacetylene	g			242.0	54.3
2-Chlorobenzaldehyde	lq	-118.4			
3-Chlorobenzaldehyde	lq	-126.0			
4-Chlorobenzaldehyde	c	-146.4			
Chlorobenzene	lq	11.0	89.2	209.2	150.2
2-Chlorobenzoic acid	c	-404.5			
3-Chlorobenzoic acid	c	-423.3			
4-Chlorobenzoic acid	c	-428.9			163.2
Chloro-1,4-benzoquinone	c	-220.6			
1-Chlorobutane	lq	-188.1			175.0
	g	-154.6	-38.8	358.1	107.6
(\pm)-2-Chlorobutane	lq	-192.8			
	g	-161.2	-53.5	359.6	108.5
2-Chlorobutanoic acid	lq	-575.5			

TABLE 6.1 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of Organic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ·mol ⁻¹	$\Delta_f G^\circ$ kJ·mol ⁻¹	S° J·deg ⁻¹ ·mol ⁻¹	C_p° J·deg ⁻¹ ·mol ⁻¹
3-Chlorobutanoic acid	lq	-556.3			
4-Chlorobutanoic acid	lq	-566.3			
Chlorocyclohexane	lq	-207.2			
1-Chloro-1,1-difluoroethane	lq				130.5 ²¹
	g			307.2	82.5
1-Chloro-2,2-difluoroethylene	g	-315.5	-289.1	303.0	72.1
2-Chloro-1,1-difluoroethylene	g	-331.4	-305.0	302.4	
Chlorodifluoromethane	lq				93.0 ⁻⁴¹
	g	-482.6	-450.0	281.0	55.9
2-Chloro-1,4-dihydroxybenzene	c	-382.81			
Chlorodimethylsilane	lq	-79.8			
1-Chloro-2,3-epoxypropane	lq	-148.5			125.1
1-Chloroethane	lq	-136.8	-59.3	190.8	104.3
	g	-112.1	-60.5	275.8	62.6
2-Chloroethanol	lq	-295.4			
1-Chloro-2-ethylbenzene	lq	-54.1			
1-Chloro-4-ethylbenzene	lq	-51.7			
Chloroethylene (vinyl chloride)	lq				89.4
	g	37.3	53.6	263.9	53.7
2-Chloroethyl ethyl ether	g	-301.3			
2-Chloroethyl vinyl ether	g	-170.1			
Chloroethyne	g	213.0	197.0	241.9	54.3
1-Chloro-1-fluoroethane	g	-313.4			
2-Chlorohexane	lq	-246.1			
Chlorofluoromethane	g	-290.8	-265.5	264.3	47.0
Chlorohydroquinone	c	-382.8			
Chloriodomethane	g	12.6	15.4	296.1	
Chloromethane	lq				75.6 ⁻²⁴
	g	-81.9	-58.5	234.6	40.8
1-Chloro-3-methylbutane	lq	-216.0			175.1
	g	-179.7			
2-Chloro-2-methylbutane	g	-202.2			
2-Chloro-3-methylbutane	g	-185.1			
1-Chloro-2-methylpropane	lq	-191.1			158.6
	g	-159.4	-49.7	355.0	108.5
2-Chloro-2-methylpropane	lq	-211.2			172.8
	g	-182.2	-64.1	322.2	114.2
1-Chloronaphthalene	lq	54.6			212.6
2-Chloronaphthalene	c	55.2			
1-Chlorooctane	lq	-291.3			198.5
Chloropentafluoroacetone	g	-1121.0			
Chloropentafluoroethane	lq				184.2
	g	-1188.8			
1-Chloropentane	lq	-213.2			
	g	-175.0	-37.4	397.0	130.5
3-Chlorophenol	c	-206.4			
4-Chlorophenol	c	-197.9			
1-Chloropropane	lq	-160.6			132.2
	g	-131.9	-50.7	319.1	84.6
2-Chloropropane	lq	-172.1			
	g	-144.9	-62.5	304.2	87.3

TABLE 6.1 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of Organic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ·mol ⁻¹	$\Delta_f G^\circ$ kJ·mol ⁻¹	S° J·deg ⁻¹ ·mol ⁻¹	C_p° J·deg ⁻¹ ·mol ⁻¹
2-Chloro-1,3-propanediol	lq	-517.5			
3-Chloro-1,2-propanediol	lq	-525.3			
2-Chloropropanoic acid	lq	-522.5			131.6
3-Chloropropanoic acid	c	-549.3			
2-Chloro-1-propene	g	-21.0			
3-Chloro-1-propene (allyl chloride)	lq				125.1
	g	-0.63	43.6	306.7	75.4
<i>N</i> -Chlorosuccinimide	c	-358.1			
α -Chlorotoluene	lq	-32.6			
<i>o</i> -Chlorotoluene	lq				166.8
2-Chloro-1,1,1-trifluoroethane	g			326.4	154.6
Chlorotrifluoroethylene	g	-505.5	-523.8	322.1	83.9
Chlorotrifluoromethane	g	-707.8	-667.4	285.4	66.9
Chlorotrimethylsilane	lq	-384.1			
Chlorotrinitromethane	lq	-27.1			
	g	18.4			
Chrysene	c	145.3			
(-)-Cinchonidine	c	29.7			
Cinchonine	c	31.0			
<i>cis</i> -Cinnamic acid	c	-315.0			
<i>trans</i> -Cinnamic acid	c	-338.5			
Cinnamic anhydride	c	-347.7			
Citric acid	c	-1543.9	-1236.4	166.2	
Codeine monohydrate	c	-632.6			
Creatine	c	-537.2			
<i>o</i> -Cresol	c	-204.6		165.4	154.6
	lq				233.6 ⁴⁰
	g	-128.6	37.1	357.6	130.3
<i>m</i> -Cresol	lq	-194.0		212.6	224.9
	g	-132.3	-40.5	356.8	122.5
<i>p</i> -Cresol	c	-199.3		167.3	150.2
	lq				221.0 ⁴⁰
	g	-125.4	-30.9	347.6	124.5
Cuban	c	541.3			
Cyanamide	c	58.8			
Cyanide (CN)	g	437.6	407.5	202.6	29.2
Cyanogen	g	306.7	297.2	241.9	56.9
Cyanogen bromide	g	140.5	165.3	248.3	46.9
Cyanogen chloride	g	138.0	131.0	236.2	45.0
Cyanogen fluoride	g	-639.8		224.7	41.8
Cyanogen iodide	c	166.2	185.0	96.2	
	g	205.5	196.6	256.8	48.3
Cyclobutane	g	27.7	110.0	265.4	72.2
Cyclobutanecarbonitrile	lq	103.0			
Cyclobutene	g	156.7	174.7	263.5	67.1
Cyclobutylamine	g	41.2			
Cyclododecane	c	-306.6			
1,3-Cycloheptadiene	g	94.3			
Cycloheptane	lq	-156.6	54.1	242.6	123.1

TABLE 6.1 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of Organic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ·mol ⁻¹	$\Delta_f G^\circ$ kJ·mol ⁻¹	S° J·deg ⁻¹ ·mol ⁻¹	C_p° J·deg ⁻¹ ·mol ⁻¹
Cycloheptanone	lq	-299.4			
1,3,5-Cycloheptatriene	lq	142.2	243.1	214.6	162.8
Cycloheptene	g	-9.2			
Cyclohexane	lq	-156.4	26.7	204.4	154.9
	g	-123.4	31.8	298.3	106.3
<i>cis</i> -Cyclohexane-1,2-dicarboxylic acid	c	-961.1			
<i>trans</i> -Cyclohexane-1,2-dicarboxylic acid	c	-970.7			
Cyclohexanethiol	lq	-140.7		255.6	192.6
	g	-96.1			
Cyclohexanol	lq	-348.1	-133.3	199.6	208.2
Cyclohexanone	lq	-271.2		255.6	182.2
	g	-226.1	-90.8	322.2	109.7
Cyclohexene	lq	-38.5	101.6	214.6	148.3
1-Cyclohexenylmethanol	lq	-382.4			
Cyclohexylamine	lq	-147.7			
Cyclohexylbenzene	lq	-76.6			261.3
Cyclohexylcyclohexane	lq	-329.3			
Cyclooctane	lq	-167.7			
Cyclooctanone	lq	-326.0			
1,3,5,7-Cyclooctatetraene	lq	254.5	358.6	220.3	184.0
Cyclooctene	lq	-74.0			
1,3-Cyclopentadiene	g	134.3	179.3	267.8	
Cyclopentane	lq	-105.1	36.4	204.3	128.9
	g	-76.4	38.6	292.9	83.0
<i>cis</i> -1,2-Cyclopentanediol	c	-484.9			
<i>trans</i> -1,2-Cyclopentanediol	c	-489.9			
Cyclopentanethiol	lq	-89.5	46.8	256.9	165.2
Cyclopentanol	lq	-300.1	-127.8	206.3	184.1
Cyclopentanone	lq	-235.7			154.5
Cyclopentene	lq	4.4	108.5	201.3	122.4
	g	34.0	110.8	291.8	75.1
1-Cyclopentenylmethanol	lq	34.3			
Cyclopentylamine	lq	-95.1		241.0	181.2
Cyclopropane	g	53.3	104.4	237.4	55.6
Cyclopropanecarbonitrile	g	182.8			
Cyclopropene	g	277.1	286.3	223.3	
Cyclopropylamine	lq	45.8		187.7	147.1
	g	77.0			
Cyclopropylbenzene	lq	100.3			
(-)-Cysteine	c	-534.1			
(-)-Cystine	c	-1032.7			
Cytosine	c	-221.3		132.6	
Decafluorobutane	lq				127.2 ²⁰
<i>cis</i> -Decahydronaphthalene	lq	-219.4	68.9	265.0	232.0
<i>trans</i> -Decahydronaphthalene	lq	-230.6	57.7	265.0	228.5
Decanal	g	-330.9	-66.5	578.6	239.7
Decane	lq	-300.9	17.5	425.5	314.4
Decanedioic acid	c	-1082.8			
1,10-Decanediol	c	-693.5			

TABLE 6.1 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of Organic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ·mol ⁻¹	$\Delta_f G^\circ$ kJ·mol ⁻¹	S° J·deg ⁻¹ ·mol ⁻¹	C_p° J·deg ⁻¹ ·mol ⁻¹
1-Decanenitrile	lq	-158.4			
1-Decanethiol	lq	-276.5		476.1	350.4
	g	-211.5	61.4	610.1	255.6
Decanoic acid	c	-713.7			
1-Decanol	lq	-478.1	-132.2	430.5	370.6
1-Decene	lq	-173.8	105.0	425.0	300.8
1-Decyne	g	41.2	252.2	524.5	219.7
Deoxybenzoin	c	-71.0			
Diacetamide	c	-489.0			
Diacetyl peroxide	lq	-535.3			
1,2-Diallyl phthalate	lq	-550.6			
2,2'-Diaminodiethylamine	lq				254 ⁴⁰
2,6-Diaminopyridine	c	-6.5			
Diazomethane	g	192.5	217.8	242.8	52.5
Dibenz[de,kl]anthracene	c	182.8			
1,2-Dibenzoylthane	c	-255.6			
trans-1,2-Dibenzoylethylene	c	-114.7	109.8	319.2	
Dibenzoylmethane	c	-223.5			
Dibenzoyl peroxide	c	-369.6			
Dibenzyl	c	44.1	260.0	269.4	255.2
Dibenzyl sulfide	c	99.0			
Dibenzyl sulfone	c	-282.6			
1,2-Dibromobutane	g	-91.5	-13.1	408.8	127.1
1,3-Dibromobutane	lq	-148.0			
1,4-Dibromobutane	g	-87.8			
2,3-Dibromobutane	g	-102.0			
Dibromochlorofluoromethane	g	-231.8	-223.4	342.8	82.4
Dibromochloromethane	g	-20.9	-18.8	327.7	69.2
1,2-Dibromo-1-chloro-1,2,2-trifluoroethane	lq	-691.7			
	g	-656.6			
1,2-Dibromocycloheptane	lq	-157.6			
1,2-Dibromocyclohexane	lq	-162.8			
1,2-Dibromocyclooctane	lq	-173.3			
Dibromodifluoroethane	g	-36.9		327.7	80.8
Dibromodichloromethane	g	-29.3	-19.5	347.8	87.1
Dibromodifluoromethane	g	-429.7	-419.1	325.3	77.0
1,1-Dibromoethane	lq	-66.2			
1,2-Dibromoethane	lq	-79.2	-20.9	223.3	136.0
	g	-37.5			
cis-1,2-Dibromoethylene	g			313.3	68.8
trans-1,2-Dibromoethylene	g			313.5	70.3
Dibromofluoromethane	g	-223.4	-221.1	316.8	65.1
Dibromomethane	lq				105.3
	g	-14.8	-16.2	293.2	54.7
1,3-Dibromo-2-methylpropane	g	-137.6			
1,3-Dibromotetrafluoroethane	lq	-817.7			
	g	-789.1			
1,2-Dibromopropane	lq				160.0
	g	-71.5	-17.7	376.1	102.8
1,2-Dibromotetrafluoroethane	lq				180.3

TABLE 6.1 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of Organic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ·mol ⁻¹	$\Delta_f G^\circ$ kJ·mol ⁻¹	S° J·deg ⁻¹ ·mol ⁻¹	C_p° J·deg ⁻¹ ·mol ⁻¹
Dibutoxymethane	lq	-549.4			
Dibutylamine	lq	-206.0			292.9
Dibutyl disulfide	g	-160.6	53.9	572.8	231.1
Di- <i>tert</i> -butyl disulfide	lq	-255.2			
Dibutyl ether	lq	-377.9			278.2
	g	-332.8	-88.5	500.4	204.0
Di- <i>sec</i> -butyl ether	lq	-401.5			
	g	-360.9			
Di- <i>tert</i> -butyl ether	lq	-399.6			276.1
	g	-362.0			
Dibutylmercury	lq	-97.9			
Dibutyl peroxide	lq	-380.7			
Dibutyl 1,2-phthalate	c	-842.6			498.0
Dibutyl sulfate	lq	-904.6			
Dibutyl sulfide	lq	-220.7	32.2	405.1	284.3
Di- <i>tert</i> -butyl sulfide	lq	-232.4			
Dibutyl sulfite	lq	-693.1			
Dibutyl sulfone	c	-610.2			
Dichloroacetic acid	lq	-496.3			
ionized	aq	-507.1			
Dichloroacetyl chloride	lq	-280.4			
1,2-Dichlorobenzene	lq	-17.5			162.4
	g	30.2	82.7	341.5	113.5
1,3-Dichlorobenzene	lq	-20.7			171
	g	25.7	78.6	343.5	113.8
1,4-Dichlorobenzene	c	-42.3			
	lq			175.4	147.8
	g	22.5	77.2	336.7	113.9
Dichlorodifluoromethane	lq				117.2
	g	-477.4	-439.4	300.8	72.3
1,3-Dichlorobutane	g	-195.0			
1,4-Dichlorobutane	g	-183.4			
Dichlorodimethylsilane	g	-461.1		335.4	101.1
Dichlorodiphenylsilane	lq	-278.2			
1,1-Dichloroethane	lq	-158.4			126.3
	g	-127.7	-73.8	305.1	76.2
1,2-Dichloroethane	lq	-167.4			128.4
	g	-126.4	-73.9	308.4	78.7
1,1-Dichloroethylene	lq	-23.9			111.3
	g	2.8	25.4	289.1	67.0
<i>cis</i> -1,2-Dichloroethylene	g	4.6	24.4	289.5	65.1
<i>trans</i> -1,2-Dichloroethylene	lq	-23.1			116.8
	g	5.0	28.6	289.9	66.7
Dichlorofluoromethane	g	-283.0	-253.0	293.1	61.0
1,1-Dichloro-1-fluoroethane	g			320.2	88.7
1,1-Dichlorofluoroethylene	g			313.9	76.5
1,1-Dichlorofluoromethane	lq				112.6
Dichloromethane	lq	-124.2		177.8	101.2
	g	-95.4	-68.9	270.3	51.0
Dichloropentadienyliron	c	141.0			
1,2-Dichloropropane	lq	-198.8			

TABLE 6.1 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of Organic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ·mol ⁻¹	$\Delta_f G^\circ$ kJ·mol ⁻¹	S° J·deg ⁻¹ ·mol ⁻¹	C_p° J·deg ⁻¹ ·mol ⁻¹
	g	-162.8	-83.1	354.8	98.2
1,3-Dichloropropane	g	-159.2	-82.6	367.2	99.6
2,2-Dichloropropane	g	-173.2	-84.6	326.0	105.9
1,3-Dichloro-2-propanol	lq	-385.4			
2,3-Dichloro-1-propanol	lq	-381.3			
2,3-Dichloropropene	lq	-73.3			
1,2-Dichlorotetrafluoromethane	lq				164.2
	g	-916.3			
2,2-Dichlorotetrafluoroethane	lq	-960.2			111.7
2,2-Dichloro-1,1,1-trifluoroethane	g			352.8	102.5
Dicyanoacetylene	lq	500.4			
Dicyanobenzene	c	275.4			
1,4-Dicyanobutane	lq	85.1			128.7
1,4-Dicyano-2-butyne	c	366.5			
Dicyanodiamide	c	22.6	179.5	129.3	118.8
Dicyclopentadiene	c	116.7			
Diethanolamine	c	-493.8			
	lq				233.5 ³⁰
1,1-Diethoxyethane	lq	-491.4			238.0
1,2-Diethoxyethane	lq	-451.4			259.4
Diethoxymethane	lq	-450.4			
1,3-Diethoxypropane	lq	-482.1			
2,2-Diethoxypropane	lq	-538.5			
Diethylamine	lq	-103.7			169.2
	g	-72.2	72.1	352.2	115.7
Diethylamine hydrochloride	c	-358.6			
Diethylbarbituric acid (veronal)	c	-747.7			
1,2-Diethylbenzene	g	-19.0	141.1	434.3	182.6
1,3-Diethylbenzene	g	-21.8	136.7	439.3	176.9
1,4-Diethylbenzene	g	-22.3	137.9	434.0	176.2
Diethyl carbonate	lq	-681.5			212.4
cis-1,2-Diethylcyclopropane	lq	-79.9			
trans-1,2-Diethylcyclopropane	lq	83.3			
Diethyl disulfide	lq	-120.0	9.5	269.3	171.4
	g	-79.4	22.3	414.5	141.3
Diethylenediamine	c	-13.4	240.2	85.8	
Diethylene glycol	lq	-628.5			244.8
	g	-571.1		441.0	135.1
Diethylene glycol dibutyl ether	lq				452 ²⁰
Diethylene glycol diethyl ether	lq				341.4 ¹⁵
Diethylene glycol dimethyl ether	lq				274.1
Diethylene glycol monoethyl ether	lq				301.0
Diethylene glycol monomethyl ether	lq				271.1
Diethyl ether	lq	-279.5	-116.7	172.4	172.6
	g	-252.1	-122.3	342.7	119.5

TABLE 6.1 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of Organic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ·mol ⁻¹	$\Delta_f G^\circ$ kJ·mol ⁻¹	S° J·deg ⁻¹ ·mol ⁻¹	C_p° J·deg ⁻¹ ·mol ⁻¹
Di-2-ethylhexyl phthalate	lq				704.7
Diethyl malonate	lq	-805.5			260.7
Diethylmercury	lq	30.1			182.8
Diethyl oxalate	lq	-805.5			
3,3-Diethylpentane	lq	-275.4			278.2
Diethyl peroxide	lq	-223.3			
Diethyl 1,2-phthalate	lq	-776.6		425.1	366.1
Diethyl selenide	lq	-96.2			
Diethyl sulfate	lq	-813.2			
Diethyl sulfide	lq	-119.4		269.3	171.4
	g	-83.6	17.8	368.0	117.0
Diethyl sulfite	lq	-600.7			
Diethyl sulfone	c	-515.5			
Diethyl sulfoxide	lq	-268.0			
<i>N,N</i> -Diethylurea	c	-372.2			
Diethylzinc	lq	16.7			
1,2-Difluorobenzene	lq	-330.0		222.6	159.0
	g	-293.8	-242.0	321.9	106.5
1,3-Difluorobenzene	lq	-343.9		223.8	159.1
	g	-309.2	-257.0	320.4	106.3
1,4-Difluorobenzene	lq	-342.3			157.5
	g	-306.7	-252.8	315.6	106.9
2,2'-Difluorobiphenyl	c	-295.9			
4,4'-Difluorobiphenyl	c	-296.5			
1,1-Difluoroethane	lq				118.4
	g	-497.0	-443.0	282.4	67.8
1,1-Difluoroethylene	g	-335.0	-321.5	266.2	60.1
Difluoromethane	g	-452.2	-425.4	246.6	42.9
9,10-Dihydroanthracene	c	66.4			
1,2-Dihydronaphthalene	lq	71.5			
1,4-Dihydronaphthalene	lq	84.2			
Dihydro-2 <i>H</i> -pyran	lq	-157.4			
5,12-Dihydrotetracene	c	106.4			
2,3-Dihydrothiophene	lq	52.9			
	g	90.7	133.5	303.5	79.8
2,5-Dihydrothiophene	g	86.9	131.6	297.1	83.3
2,5-Dihydrothiophene-1,1-dioxide	c	318.9			
2',4-Dihydroxyacetophenone	c	-573.6			
1,2-Dihydroxybenzene (pyrocatechol)	c	-354.1	-210.0	150.2	132.2
1,3-Dihydroxybenzene	c	-368.0	-209.2	147.7	131.0
1,4-Dihydroxybenzene (<i>p</i> -hydroquinone)	c	-364.5	-207.0	140.2	136.0
Dihydroxymalonic acid	c	-1216.3			
2,4-Dihydroxy-5-methylpyrimidine	c	-468.2			
2,4-Dihydroxy-6-methylpyrimidine	c	-456.9			
Diiodoacetylene	g			313.1	70.3
1,2-Diiodobenzene	c	172.4			

TABLE 6.1 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of Organic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ·mol ⁻¹	$\Delta_f G^\circ$ kJ·mol ⁻¹	S° J·deg ⁻¹ ·mol ⁻¹	C_p° J·deg ⁻¹ ·mol ⁻¹
1,3-Diiodobenzene	c	187.0			
1,4-Diiodobenzene	lq	-30.0			
	c	160.7			
1,2-Diiodoethane	g	75.0	78.5	348.5	82.3
Diiodomethane	lq	66.9	90.4	174.1	134.0
	g	119.5	95.8	309.7	57.7
1,2-Diiodopropane	g	35.6			
1,3-Diiodopropane	lq	-9.0			
Diisobutylamine	lq	-218.5			
Diisopentyl ether	lq				379 ¹⁰⁰
Diisopropylamine	lq	-178.5			
Diisopropyl ether	lq	-351.5			216.8
	g	-319.2	-121.9	390.2	158.3
Diisopropylmercury	lq	-13.0			
Diisopropyl sulfide	lq	-181.6		313.0	232.0
	g	-142.1	27.1	415.5	169.2
Diketene	lq	-233.1			
1,2-Dimethoxybenzene	lq	-290.4			
1,1-Dimethoxybutane	lq	-468.1			
2,2-Dimethoxybutane	lq	-485.1			
1,1-Dimethoxyethane	lq	-420.2			
1,2-Dimethoxyethane	lq	-376.7			193.3
Dimethoxymethane	lq	-377.8		244.0	161.3
1,1-Dimethoxypentane	lq	-494.6			
2,2-Dimethoxypentane	lq	-509.2			
1,1-Dimethoxypropane	lq	-443.3			
2,2-Dimethoxypropane	lq	-459.0			
1,1-Dimethoxy-2-methyl- propane	lq	-476.2			
N,N-Dimethylacetamide	lq	-278.3			175.6
Dimethylamine	lq	-43.9	70.0	182.3	137.7
	g	-18.5	68.5	273.0	70.7
4-(Dimethylamino)benz- aldehyde	c	-137.6			
Dimethylaminomethanol	lq	-253.6			
N,N-Dimethylaminotri- methylsilane	lq	-279.5			
N,N-Dimethylaniline	lq	47.7			214.6 ²⁹
2,6-Dimethylaniline	lq				238.9
2,3-Dimethylbenzoic acid	c	-450.4			
2,4-Dimethylbenzoic acid	c	-458.5			
2,5-Dimethylbenzoic acid	c	-456.1			
2,6-Dimethylbenzoic acid	c	-440.7			
3,4-Dimethylbenzoic acid	c	-468.8			
3,5-Dimethylbenzoic acid	c	-466.4			
3,3'-Dimethylbiphenyl	lq	20.0			
2,2-Dimethylbutane	lq	-213.8		272.5	191.9
	g	-186.1	-9.2	358.2	141.9
2,3-Dimethylbutane	lq	-207.4		287.8	189.7
	g	-178.3	-4.1	365.8	140.5
3,3-Dimethyl-2-butanone	lq	-328.6			

TABLE 6.1 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of Organic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ·mol ⁻¹	$\Delta_f G^\circ$ kJ·mol ⁻¹	S° J·deg ⁻¹ ·mol ⁻¹	C_p° J·deg ⁻¹ ·mol ⁻¹
2,3-Dimethyl-1-butene		-62.6	79.0	365.6	143.5
2,3-Dimethyl-2-butene	lq	-101.4		270.2	174.7
	g	-68.2	76.1	364.6	123.6
3,3-Dimethyl-1-butene	g	-60.5	98.2	343.8	126.5
2,3-Dimethyl-2-butenic acid	c	-455.6			
Dimethylcadmium	lq	63.6	139.3	201.9	132.0
1,1-Dimethylcyclohexane	lq	-218.7	26.5	267.2	209.2
	g	-180.9	35.2	365.0	154.4
<i>cis</i> -1,2-Dimethylcyclohexane	lq	-211.8		274.1	210.2
	g	-172.1	41.2	374.5	165.5
<i>trans</i> -1,2-Dimethylcyclohexane	lq	-218.2		273.2	209.4
	g	-180.0	34.5	370.9	159.0
<i>cis</i> -1,3-Dimethylcyclohexane	lq	-222.9		272.6	209.4
	g	-184.6	29.8	370.5	157.3
<i>trans</i> -1,3-Dimethylcyclohexane	lq	-215.7		276.3	212.8
	g	-176.5	36.3	376.2	157.3
<i>cis</i> -1,4-Dimethylcyclohexane	lq	-215.6		271.1	212.1
	g	-176.6	38.0	370.5	157.3
<i>trans</i> -1,4-Dimethylcyclohexane	lq	-222.4		268.0	210.2
	g	-184.5	31.7	364.8	157.7
1,1-Dimethylcyclopentane	g	-138.2	39.0	359.3	133.3
<i>cis</i> -1,2-Dimethylcyclopentane	lq	-165.3		269.2	
	g	-129.5	45.7	366.1	134.14
<i>trans</i> -1,2-Dimethylcyclopentane	g	-136.6	38.4	366.8	134.5
<i>cis</i> -1,3-Dimethylcyclopentane	g	-135.9	39.2	366.8	134.5
<i>trans</i> -1,3-Dimethylcyclopentane	g	-133.6	41.5	366.8	134.5
1,1-Dimethylcyclopropane	lq	-33.3			
<i>cis</i> -1,2-Dimethylcyclopropane	lq	-26.3			
<i>trans</i> -1,2-Dimethylcyclopropane	lq	-30.7			
<i>cis</i> -2,4-Dimethyl-1,3-dioxane	lq	-465.2			
4,5-Dimethyl-1,3-dioxane	lq	-451.6			
5,5-Dimethyl-1,3-dioxane	lq	-461.3			
4,4'-Dimethyldiphenylamine	c	-11.72			
Dimethyl disulfide	lq	-62.6	7.0	235.4	146.1
Dimethyl ether	g	-184.1	-112.6	266.4	64.4
<i>N,N</i> -Dimethylformamide	lq	-239.3			150.6
Dimethyl fumarate	lq	-729.3			
Dimethylglyoxime	c	-199.7			
2,2-Dimethylheptane	lq	-288.2			
2,6-Dimethyl-4-heptanone	lq	-408.5			297.3
2,2-Dimethylhexane	lq	-261.9	3.0	331.9	
2,3-Dimethylhexane	lq	-252.6	9.1	342.7	
2,4-Dimethylhexane	lq	-257.0	3.7	345.7	
2,5-Dimethylhexane	lq	-260.4	2.5	338.7	249.2
3,3-Dimethylhexane	lq	-257.5	5.2	339.4	246.6
3,4-Dimethylhexane	lq	-251.8	8.5	347.2	
Dimethyl hexanedioate	lq	-886.6			
<i>cis</i> -2,2-Dimethyl-3-hexene	lq	-126.4			
<i>trans</i> -2,2-Dimethyl-3-hexene	lq	-144.9			
<i>cis</i> -2,5-Dimethyl-3-hexene	lq	-151.0			
<i>trans</i> -2,5-Dimethyl-3-hexene	lq	-159.2			

TABLE 6.1 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of Organic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ·mol ⁻¹	$\Delta_f G^\circ$ kJ·mol ⁻¹	S° J·deg ⁻¹ ·mol ⁻¹	C_p° J·deg ⁻¹ ·mol ⁻¹
5,5-Dimethylhydantoin	c	-533.3			
1,1-Dimethylhydrazine	lq	48.9	206.7	198.0	164.1
1,2-Dimethylhydrazine	lq	52.7	212.6	199.2	171.0
3,5-Dimethylisoxazole	lq	-63.2			
Dimethyl maleate	lq	-703.8			263.2
Dimethylmaleic anhydride	c	-581.6			
Dimethyl malonate	lq	-795.8			
Dimethylmercury	lq	59.8	140.3	209.0	
	g	94.4	146.1	306.0	83.3
6,6-Dimethyl-2-methylene-bicyclo[3.1.1]heptane	lq	-7.7			
Dimethyl oxalate	lq	-756.3			
2,2-Dimethylpentane	lq	-238.3		300.3	221.1
	g	-205.9	0.1	392.9	166.0
2,3-Dimethylpentane	lq	-233.1			218.3
	g	-198.9	0.7	414.0	166.0
2,4-Dimethylpentane	lq	-234.6		303.2	224.2
	g	-201.7	3.1	396.6	166.0
3,3-Dimethylpentane	lq	-234.2			
	g	-201.2	2.6	399.7	166.0
Dimethyl pentanedioate	lq	-205.9			
2,4-Dimethyl-3-pentanone	lq	-352.9		318.0	233.7
	g	-311.5			
2,4-Dimethyl-1-pentene	g	-83.8			
4,4-Dimethyl-1-pentene	g	-81.6			
2,4-Dimethyl-2-pentene	g	-88.7			
cis-4,4-Dimethyl-2-pentene	g	-72.6			
trans-4,4-Dimethyl-2-pentene	g	-88.8			
2,7-Dimethylphenanthrene	c	36.4			
4,5-Dimethylphenanthrene	c	89.0			
9,10-Dimethylphenanthrene	c	47.7			
2,3-Dimethylphenol	c	-241.2			206.9
2,4-Dimethylphenol	lq	-228.7			
2,5-Dimethylphenol	c	-246.6			
2,6-Dimethylphenol	c	-237.4			
3,4-Dimethylphenol	c	-242.3			
3,5-Dimethylphenol	c	-244.4			
Dimethyl 1,2-phthalate	lq	-678			303.1
Dimethyl 1,3-phthalate	c	-730.0			
Dimethyl 1,4-phthalate	c	-732.6			261.1
2,2-Dimethylpropane	lq				163.9 ⁶
	g	-168.0	-1.5	306.4	121.6
2,2-Dimethylpropanenitrile	lq	-39.8		232.0	179.4
2,2-Dimethyl-1,3-propanediol	c	-551.2			
2,2-Dimethylpropanoic acid	lq	-564.4			
2,2-Dimethylpropanoic anhydride	lq	-779.9			
2,2-Dimethyl-1-propanol	lq	-399.4			
2,3-Dimethylpyridine	lq	19.4		243.7	189.5
2,4-Dimethylpyridine	lq	16.2		248.5	184.8
2,5-Dimethylpyridine	lq	18.7		248.8	184.7

TABLE 6.1 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of Organic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ·mol ⁻¹	$\Delta_f G^\circ$ kJ·mol ⁻¹	S° J·deg ⁻¹ ·mol ⁻¹	C_p° J·deg ⁻¹ ·mol ⁻¹
2,6-Dimethylpyridine	lq	12.7		249.2	185.2
3,4-Dimethylpyridine	lq	18.3		240.7	191.8
3,5-Dimethylpyridine	lq	22.5		241.7	184.5
Dimethyl succinate	lq	-835.1			
2,2-Dimethylsuccinic acid	c	-987.8			
<i>meso</i> -2,3-Dimethylsuccinic acid	c	-977.5			
Dimethyl sulfate	lq	-735.5			
Dimethyl sulfide	lq	-65.4			118.1
	g	-37.5	7.0	285.9	74.1
Dimethyl sulfite	lq	-523.6			
Dimethyl sulfone	c	-450.1	-302.5	142.0	
	lq	-373.1	-272		
	g			310.6	100.0
Dimethyl sulfoxide	lq	-204.2	-99.2	188.3	153.0
1,5-Dimethyltetrazole	c	188.7			
2,2-Dimethylthiacyclopropane	lq	-24.2			
5,5-Dimethyl-4-thia-1-hexene	lq	-90.7			
<i>N,N</i> -Dimethylurea	c	-319.1			
<i>N,N'</i> -Dimethylurea	c	-312.1			
Dimethylzinc	lq	23.4		201.6	129.2
2,3-Dinitroaniline	c	-11.7			
2,4-Dinitroaniline	c	-67.8			
2,5-Dinitroaniline	c	-44.4			
2,6-Dinitroaniline	c	-50.6			
3,4-Dinitroaniline	c	-32.6			
3,5-Dinitroaniline	c	-38.9			
2,4-Dinitroanisole	c	-186.6			
2,6-Dinitroanisole	c	-189.1			
1,2-Dinitrobenzene	c	-1.8	211.5	216.3	
1,3-Dinitrobenzene	c	-27.4	184.6	220.9	
1,4-Dinitrobenzene	c	-38.7			
1,1-Dinitroethane	lq	-148.2			
1,2-Dinitroethane	lq	-165.2			
Dinitromethane	lq	-104.9			
	g	-58.9			
1,5-Dinitronaphthalene	c	30.5			
2,4-Dinitro-1-naphthol	c	-181.4			
2,4-Dinitrophenol	c	-232.6			
2,6-Dinitrophenol	c	-210.0			
1,1-Dinitropropane	lq	-163.2			
1,3-Dinitropropane	lq	-207.1			
2,2-Dinitropropane	lq	-181.2			
2,4-Dinitroresorcinol	c	-415.5			
2,4-Dinitrotoluene	c	-71.6			
2,6-Dinitrotoluene	c	-51.0			
1,3-Dioxane	lq	-379.7			143.9
1,4-Dioxane	lq	-353.9	-188.1	270.2	153.6
	g	-315.8	-180.8	299.8	94.1
1,3-Dioxolane	lq	-333.5			118.0
	g	-298.0			

TABLE 6.1 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of Organic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ·mol ⁻¹	$\Delta_f G^\circ$ kJ·mol ⁻¹	S° J·deg ⁻¹ ·mol ⁻¹	C_p° J·deg ⁻¹ ·mol ⁻¹
1,3-Dioxolan-2-one	c	-581.6			133.9 ⁵⁰
1,3-Dioxol-2-one	lq	-459.9			
Dipentene	lq	-50.8			249.4
Dipentyl ether	lq				250
<i>N,N</i> -Diphenylacetamide	c	-43.1			
Diphenylacetylene	c	312.4			225.9
Diphenylamine	c	130.6			
Diphenylboron bromide	lq	-16.1			
<i>cis,cis</i> -1,4-Diphenylbutadiene	c	198.8			
<i>trans,trans</i> -1,4-Diphenylbutadiene	c	178.8			
Diphenylbutadiyne	c	518.4			
1,4-Diphenylbutane	c	-9.9			
1,4-Diphenyl-1,4-butanedione	c	-256.2	7.8	324.7	
1,4-Diphenyl-2-butene-1,4-dione	c	-114.7	111.5	319.2	
Diphenyl carbonate	c	-401.2	-175.9	278.4	
Diphenyl disulfide	c	-148.5			
Diphenyl disulfone	c	-643.2			
Diphenyleneimine	c	126.8			
1,1-Diphenylethane	lq	48.7	245.1	335.9	
1,2-Diphenylethane	lq	51.5	67.2	270.3	
Diphenylethanedione	c	-154.0			
Diphenyl ether	c	-32.1		233.9	216.6
	lq	-14.9	144.2	291.3	268.6
1,1-Diphenylethylene	lq	172.4			
Diphenylethyne	c	312.4			
6,6-Diphenylfulvene	c	197.4			
1,2-Diphenylhydrazine	c	221.3			
Diphenylmercury	c	279.5			
Diphenylmethane	c	71.7		239.3	
	lq	89.7	276.9		233.1
1,3-Diphenyl-2-propanone	c	-84.0			
Diphenyl sulfide	lq	163.4			
Diphenyl sulfone	c	-225.0			
Diphenyl sulfoxide	c	9.7			
1,3-Diphenylurea	c	-122.6			
Dipropylamine	lq	-156.1			253.0 ⁷⁵
Dipropyl disulfide	lq	-171.3	19.1	373.6	
Dipropyl ether	lq	-328.8		323.9	221.6
	g	-292.9	-105.6	422.5	158.3
Dipropylmercury	lq	-20.9			
Dipropyl sulfate	lq	-859.0			
Dipropyl sulfide	lq	-171.5			
	g	-125.3	33.2	448.4	161.2
Dipropyl sulfite	lq	-646.8			
Dipropyl sulfone	lq	-548.2			
Dipropyl sulfoxide	lq	-329.4			
2,2'-Dipyridyl ketone	c	-19.7			
1,3-Dithiane	g	-10.0	72.4	333.5	110.4
1,2-Dithiolane	g	0.0	47.7	313.5	86.5
1,3-Dithiolane	g	10.0	54.7	323.3	84.7

TABLE 6.1 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of Organic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ·mol ⁻¹	$\Delta_f G^\circ$ kJ·mol ⁻¹	S° J·deg ⁻¹ ·mol ⁻¹	C_p° J·deg ⁻¹ ·mol ⁻¹
Divinyl ether	lq	-39.8			
	g	-13.6			
Divinyl sulfone	lq	-207.4			
Docosanoic acid	c	-983.0			
<i>cis</i> -13-Docosenic acid	c	-866.0			
<i>trans</i> -13-Docosenic acid	c	-960.7			
Dodecane	lq	-350.9	28.1	490.6	376.0
	g	-289.7	50.0	622.5	280.3
Dodecanedioic acid	c	-1130.0			
Dodecanoic acid	c	-774.6			
	lq	-737.9			404.3
1-Dodecanol	lq	-528.5			438.1
1-Dodecene	lq	-226.2		484.8	360.7
	g	-165.4	137.9	618.3	269.6
1-Dodecyne	g	-0.04	268.6	602.4	265.4
Dulcitol	c	-1346.8			
1,2-Epoxybutane	lq	-168.9		230.9	147.0
Ergosterol	c	-789.9			
Ethane	g	-84.0	-32.0	229.1	52.5
Ethane- <i>d</i> ₆	g	-107.4	-47.3	244.5	64.6
1,2-Ethanediamine	lq	-63.0		209.2	172.6
1,2-Ethanediol	lq	-455.3	-323.2	163.2	149.3
	g	-392.2	-304.5	303.8	82.7
Ethanedithioamide	c	-20.8			
Ethanedioyl dichloride	lq	-367.6			
1,2-Ethanedithiol	lq	-54.4			
Ethanethiol	lq	-73.6	-5.5	207.0	117.9
	g	-46.1	-4.8	296.1	72.7
Ethanol	lq	-277.6	-174.8	161.0	112.3
	g	-234.8	-167.9	281.6	65.6
Ethene (<i>see</i> Ethylene)					
Ethoxybenzene	lq	-152.6			228.5
2-Ethoxyethyl acetate	lq				376.0
2-Ethoxyethanol	lq				210.8
Ethyl acetate	lq	-479.3	-332.7	257.7	170.7
	g	-443.6	-327.4	362.8	113.6
Ethylamine	lq				130.0
	g	-47.4	36.3	283.8	71.5
Ethyl 4-aminobenzoate	c	-418.0			
<i>N</i> -Ethylaniline	lq	4.0	188.7	239.3	
Ethylbenzene	lq	-12.3			183.2
	g	29.9	130.6	360.5	
Ethyl benzoate	lq				246.0
2-Ethylbenzoic acid	c	-441.3			
3-Ethylbenzoic acid	c	-445.8			
4-Ethylbenzoic acid	c	-460.7			
2-Ethyl-1-butene	g	-56.0	80.0	376.6	133.6
Ethyl <i>trans</i> -2-butenate (ethyl crotonate)	lq	-420.1			228.0
Ethyl carbamate	c	-520.5			
Ethyl 4-chlorobutanoate	lq	-566.5			

TABLE 6.1 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of Organic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ·mol ⁻¹	$\Delta_f G^\circ$ kJ·mol ⁻¹	S° J·deg ⁻¹ ·mol ⁻¹	C_p° J·deg ⁻¹ ·mol ⁻¹
Ethyl chloroformate	lq	-505.1			
Ethylcyclobutane	g	-27.5			
Ethylcyclohexane	lq	-211.9	29.1	280.9	211.8
	g	-171.7	39.3	382.6	158.8
1-Ethylcyclohexene	lq	-106.7			
Ethylcyclopentane	lq	-163.4	37.3	279.9	185.8
1-Ethylcyclopentene	g	-19.7			
Ethylcyclopropane	lq	-24.8			
Ethyl diethylcarbamate	lq	-592.3			
Ethyl 2,2-dimethylpropanoate	lq	-577.2			
	g	-536.0			
Ethylene	g	52.5	68.4	219.3	42.9
Ethylene- <i>d</i> ₄	g	38.2	59.2	230.5	51.9
Ethylene carbonate	c	-581.5			133.9
Ethylenediaminetetra- acetic acid	c	-1759.4			
Ethylenediammonium chloride	c	-513.4			
2,2'-(Ethylenedioxy)bis- ethanol	lq	-804.2			
Ethylene glycol dibutyl ether	lq				350 ²⁰
Ethylene glycol diethyl ether	lq	-451.4			259.4
Ethylene glycol dimethyl ether	lq	-376.6			193.3
Ethyleneimine	lq	91.9			
	g	126.5(9)	178.0	250.6	52.6
Ethylene oxide	lq	-78.0	-11.8	153.9	88.0
	g	-52.6(6)	-13.1	242.4	47.9
Ethyl formate	lq				149.3
2-Ethylhexanal	lq	-342.5			
3-Ethylhexane	lq	-250.4			
	g	-210.7			
2-Ethyl-1-hexanol	lq	-432.8		347.0	317.5
Ethyl hydroperoxide	g	198.9			
Ethylidenecyclohexane	lq	-103.5			
Ethylidenecyclopentane	lq	-56.7			
Ethyl isocyanide	lq	108.4			
Ethyl isopropyl sulfide	lq	-156.1			
Ethyl lactate	lq				254
Ethyllithium	c	-58.6			
Ethylmercury bromide	c	-107.5			
Ethylmercury chloride	c	-141.1			
Ethylmercury iodide	c	-65.7			
1-Ethyl-2-methylbenzene	g	1.3	131.1	399.2	157.9
2-Ethyl-3-methyl-1-butene	g	-79.5			
Ethyl 2-methylbutanoate	lq	-566.8			
Ethyl 3-methylbutanoate	lq	-570.9			
Ethyl methyl ether	g	-216.4	-117.7	309.2	93.3
3-Ethyl-2-methylpentane	lq	-249.6			
	g	-211.0	21.3	441.1	
3-Ethyl-3-methylpentane	lq	-252.8			
	g	-214.8	19.9	433.0	
3-Ethyl-2-methyl-1-pentene	g	-100.3			

TABLE 6.1 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of Organic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ·mol ⁻¹	$\Delta_f G^\circ$ kJ·mol ⁻¹	S° J·deg ⁻¹ ·mol ⁻¹	C_p° J·deg ⁻¹ ·mol ⁻¹
Ethyl methyl sulfide	lq	-91.6		239.1	144.6
	g	-59.6	11.4	333.1	95.1
Ethyl nitrate	g	-154.1	-36.9	348.3	97.4
Ethyl nitrite	g	-104.2		103.5	99.2
1-Ethyl-2-nitrobenzene	lq	-48.7			
1-Ethyl-4-nitrobenzene	lq	-55.4			
Ethyl 3-oxobutanoate	lq				248.0
3-Ethylpentane	lq	-224.9		314.5	219.6
	g	-189.6	11.0	411.5	166.0
Ethyl pentanoate	lq	-553.0			
2-Ethylphenol	lq		-208.8		
3-Ethylphenol	lq	-214.3			
4-Ethylphenol	c	-224.4			206.9
Ethylphosphonic acid	c	-1051.4			
Ethylphosphonic dichloride	lq	-613.4			
Ethyl propanoate	lq	-502.7			196.1
	g	-463.3	-323.7		
Ethyl propyl ether	g	-272.2		295.0	197.2
Ethyl propyl sulfide	lq	-144.8		309.5	198.4
	g	-104.7	23.6	414.1	139.3
2-Ethylpyridine	lq	7.4			
S-Ethyl thioacetate	lq	-268.2			
2-Ethyltoluene	g	1.3	131.1	399.2	157.9
3-Ethyltoluene	g	-1.8	126.4	404.2	152.2
4-Ethyltoluene	g	-3.2	85.3	398.9	151.5
N-Ethylurea	c	-357.8			
Ethyl β -vinylacrylate	lq	-338.1			
Ethyl vinyl ether	lq	-167.4			
	g	-140.8			
Ethynylbenzene	g	327.3	361.8	321.7	114.9
Ethynylsilane	g			269.4	72.6
Fluoranthene	c	189.9	345.6	230.5	230.2
Fluoroacetamide	c	-496.6			
Fluoroacetic acid	c	-688.3			
Fluoroacetylene	g			269.4	72.6
Fluorobenzene	lq	-150.6		205.9	146.4
	g	-116.0	-69.0	302.6	94.4
2-Fluorobenzoic acid	c	-567.6			
3-Fluorobenzoic acid	c	-582.0			
4-Fluorobenzoic acid	c	-585.7			
Fluoroethane	g	-263.2	-211.0	264.5	58.6
2-Fluoroethanol	lq	-465.7			
Fluoroethylene	g	-138.8			
Fluoromethane	g	-237.8	-213.8	222.8	37.5
1-Fluoropropane	g	-285.9	-200.3	304.2	82.6
2-Fluoropropane	g	-293.5	-204.2	292.1	82.0
Fluorosyltrifluoromethane	g	-766.0	-707.0	322.4	79.4
4-Fluorotoluene	lq	-186.9	-79.8	237.1	171.2
Fluorotribromomethane	g	-190.4	-193.1	345.8	
Fluorotrinitromethane	lq	-220.9			
Formaldehyde	g	-108.6	-102.5	218.8	35.4

TABLE 6.1 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of Organic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ·mol ⁻¹	$\Delta_f G^\circ$ kJ·mol ⁻¹	S° J·deg ⁻¹ ·mol ⁻¹	C_p° J·deg ⁻¹ ·mol ⁻¹
Formamide	lq	-254.0			107.6
	g	-193.9	-141.0	248.6	45.4
Formanilide	c	-151.5			
Formic acid	lq	-424.7	-361.4	129.0	99.5
	g	-378.7	-351.0	248.7	45.2
Formyl fluoride	g	-376.6	-368.1	246.5(8)	40.0
D-(-)-Fructose	c	-1265.6			
D-(+)-Fucose	c	-1099.1			
Fullerene-C ₆₀	c	2327.0	2302.0	426.0	520.0
Fumaric acid	c	-811.7	-655.6	168.0	142.0
Fumaronitrile	c	268.2			
Furan	lq	-62.3		177.0	114.8
	g	-34.9	0.88	267.2	65.4
2-Furancarboxaldehyde	lq	-201.6			163.2
2-Furancarboxylic acid	c	-498.4			
2-Furanmethanol	lq	-276.2	-154.2	215.5	204.0
Furfuryl alcohol	lq	-276.2			204.0
Furylacrylic acid	c	-459.0			
Furylethylene	lq	-10.5			
D-(+)-Galactose	c	-1286.3	-918.8	205.4	
D-Gluconic acid	c	-1587.0			
D-(+)-Glucose	c	-1273.3	-910.4	212.1	
D-(-)-Glutamic acid	c	-1009.7	-727.5	191.2	
L-(+)-Glutamic acid	c	-1005.2	-731.3	188.2	
L-Glutamine	c	-826.4			
Glutaric acid	c	-960.0			
Glyceraldehyde	lq	-598.0			
Glycerol	lq	-668.5	-477.0	206.3	218.9
Glyceryl 1-acetate	lq	-909.1			
Glyceryl 1-benzoate	c	-777.3			
Glyceryl 2-benzoate	c	-772.8			
Glyceryl 1,3-diacetate	lq	-1120.7			
Glyceryl 1-dodecanoate	c	-1160.9			
Glyceryl 2-dodecanoate	c	-1152.6			
Glyceryl 1-hexadecanoate	c	-1281.5			
Glyceryl 1-hexanoate	c	-1109.0			
Glyceryl 2-hexanoate	c	-1095.8			
Glyceryl 1-octadecanoate	c	-1324.8			
Glyceryl 1-tetradecanoate	c	-1222.6			
Glyceryl triacetate	lq	-1330.8			
Glyceryl trinitrate	lq	-370.9			
Glyceryl tris(dodecanoate)	c	-2046.0			
Glyceryl tris(tetradecanoate)	c	-2176.0			
Glycine	c	-528.5	-368.6	103.5	99.2
ionized; std. state	aq	-469.8	-315.0	111.0	
⁺ H ₃ NCH ₂ COOH; std. state	aq	-517.9	-384.2	190.2	
Glycylglycine	c	-747.7	-490.6	190.0	
Glyoxal	g	-212.0			
Glyoxime	c	-90.5			
Glyoxylic acid	c	-835.5			
Guanidine	c	-56.0			

TABLE 6.1 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of Organic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ·mol ⁻¹	$\Delta_f G^\circ$ kJ·mol ⁻¹	S° J·deg ⁻¹ ·mol ⁻¹	C_p° J·deg ⁻¹ ·mol ⁻¹
Guanidine carbonate	c	-971.9	-557.4	295.4	258.9
Guanidine nitrate	c	-387.0			
Guanidine sulfate	c	-1205.0			
Guanine	c	-183.9	47.4	160.3	
Guanylurea nitrate	c	-427.2			
L-Gulonic acid- γ -lactone	c	-1219.6			
Heptadecane	g	-393.9	82.1	817.3	394.7
Heptadecanoic acid	c	-924.4			475.7
1-Heptadecene	g	-268.4	179.9	813.1	383.9
Heptanal	lq	-311.5	-100.6	335.4	230.1
	g	-264.0	-86.7	461.7	
Heptane	lq	-224.2			224.9
	g	-187.7	8.0	427.9	166.0
Heptanedioic acid	c	-1009.4			
Heptanenitrile	lq	-82.8			
1-Heptanethiol	g	-150.0	36.2	493.3	186.9
Heptanoic acid	lq	-610.2			265.4
1-Heptanol	lq	-403.3	-142.3	320.1	272.1
	g	-336.4	-120.9	480.3	178.7
2-Heptanone	lq				232.6
1-Heptene	lq	-97.9		327.6	211.8
	g	-62.3	95.8	423.6	155.2
cis-2-Heptene	lq	-105.1			
trans-2-Heptene	lq	-109.5			
cis-3-Heptene	lq	-104.3			
trans-3-Heptene	lq	-109.3			
1-Heptyne	g	103.0	226.7	407.7	151.1
Hexabromoethane	g			441.9	139.3
Hexachlorobenzene	c	-127.6	1.1	260.2	201.3
	g	-35.5	44.2	441.2	173.2
Hexachloroethane	c	-202.8		237.3	198.2
	g	-143.6	-54.9	398.7	136.7
Hexadecafluoroethylcyclohexane	lq	-3420.0			
Hexadecafluoroheptane	lq	-3420.8	-3093.0	561.8	419.0
Hexadecane	lq	-456.1			501.6
	g	-374.8	83.7	778.3	371.8
Hexadecanoic acid	c	-891.5	-316.1	452.4	460.7
1-Hexadecanol	c	-686.7	-98.7	451.9	422.0
	lq	-635.4	-96.6	606.7	
1-Hexadecene	lq	-328.7		587.9	488.9
	g	-248.5	171.5	774.1	361.0
1,5-Hexadiene	lq	54.1			
2,4-Hexadienoic acid	c	-390.8			
1,5-Hexadiyne	lq	384.2			
Hexafluoroacetone	g	-1249.3			
Hexafluoroacetylacetone	c	-2286.7			
Hexafluorobenzene	lq	-991.3		280.8	156.6
	g	-955.4	-79.4	383.2	
Hexafluoroethane	g	-1344.2	-1255.8	332.3	106.7
cis-Hexahydroindane	g	-127.2			

TABLE 6.1 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of Organic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ·mol ⁻¹	$\Delta_f G^\circ$ kJ·mol ⁻¹	S° J·deg ⁻¹ ·mol ⁻¹	C_p° J·deg ⁻¹ ·mol ⁻¹
<i>trans</i> -Hexahydroindane	g	-131.4			
Hexamethylbenzene	c	-162.4	117.4	306.3	245.6
1,1,1,3,3,3-Hexamethyldi-silazane	lq	-518.0			
Hexamethyldisiloxane	lq	-814.6	-541.8	433.8	311.4
	g	-777.7	-534.5	535.0	238.5
Hexamethylenetetramine	c	125.5	434.8	163.4	
Hexamethylphosphoric triamide	lq				321
Hexanal	g	-248.4	-100.1	422.9	148.2
Hexanamide	c	-423.0			
	lq	-397.0			
Hexane	lq	-198.8	-3.8	296.1	195.6
	g	-167.1(8)	-0.25	388.4	143.1
1,6-Hexanedioic acid	lq	-985.4	-207.3		232.2
1,2-Hexanediol	lq	-577.1			
1,6-Hexanediol	c	-569.9			
Hexanedinitrile	lq	85.1			128.7
1-Hexanethiol	g	-129.9	27.8	454.3	164.1
Hexanoic acid	lq	-583.9			225.0
1-Hexanol	lq	-377.5	-152.3	287.4	240.4
	g	-317.6	-135.6	441.4	155.6
2-Hexanol	lq	-392.9			
3-Hexanol	lq	-392.4			286.2
2-Hexanone	lq	-322.0			213.3
3-Hexanone	lq	-320.2		305.3	216.9
1-Hexene	lq	-74.1	83.6	295.1	183.3
	g	-43.5	84.45	384.6	132.3
<i>cis</i> -2-Hexene	lq	-83.9			
	g	-52.3	76.2	386.5	125.7
<i>trans</i> -2-Hexene	lq	-85.5			
	g	-53.9	76.4	380.6	132.4
<i>cis</i> -3-Hexene	lq	-79.0			
	g	-47.6	83.0	379.6	123.6
<i>trans</i> -3-Hexene	lq	-86.1			
Hexyl acetate	lq				282.8
	g	-54.4	77.6	374.8	132.8
1-Hexyne	g	123.6	218.6	368.7	128.2
(-)-Histidine	c	-466.7			
Hydantoin	c	-448.5			
Hydrazine	lq	50.6	149.2	121.2	98.9
Hydrazinecarbothioamide	c	24.7			
Hydrazobenzene	c	221.3			
Hydroxyacetic acid	c	-663.6			
2'-Hydroxyacetophenone	c	-357.7			
3'-Hydroxyacetophenone	c	370.7			
4'-Hydroxyacetophenone	c	-364.4			
2-Hydroxybenzaldehyde	lq	-279.9			
2-Hydroxybenzaldoxime	c	-183.7			
2-Hydroxybenzoic acid	c	-589.9	-421.3	178.2	159.1
3-Hydroxybenzoic acid	c	-584.9	-417.3	177.0	157.3
4-Hydroxybenzoic acid	c	-584.5	-416.5	175.7	155.1

TABLE 6.1 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of Organic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ·mol ⁻¹	$\Delta_f G^\circ$ kJ·mol ⁻¹	S° J·deg ⁻¹ ·mol ⁻¹	C_p° J·deg ⁻¹ ·mol ⁻¹
(±)-2-Hydroxybutanoic acid	lq	-679.1			
2-Hydroxy-2,4,6-cyclohepta- trienone	c	-239.2			
2-Hydroxyisobutanoic acid	c	-744.3			
2-Hydroxy-1-isopropyl-4- methylbenzene	c	-309.6			
3-Hydroxy-4-methoxybenz- aldehyde	c	-453.6			
4-Hydroxy-4-methyl-2- pentanone	lq				221.3
2-Hydroxymethyl-1,3-propane- diol	c	-744.6			
3-Hydroxy-2-naphthalene- carboxylic acid	c	-547.7			
5-Hydroxy-1-pentanal	lq	-479.9			
<i>trans</i> -(−)-4-Hydroxyproline	c	-661.1			
(<i>S</i>)-2-Hydroxypropanoic acid	c	-694.0			
2-Hydroxypropanonitrile	lq	-138.9	34.3		
2-Hydroxypyridine	c	-166.3			
3-Hydroxypyridine	c	-132.0			
4-Hydroxypyridine	c	-144.6			
8-Hydroxyquinoline	c	-81.2			
(−)-2-Hydroxysuccinic acid	c	-1103.7	-884.7		
(±)-2-Hydroxysuccinic acid	c	-1105.7			
Hypoxanthene	c	-110.8	76.9	145.6	134.5
Icosane	g	-455.8	117.3	934.1	463.3
Icosanoic acid	c	-1011.9			545.1
Icosene	g	-330.2	205.1	929.9	452.5
Imidazole	c	49.8			
Iminodiacetic acid	c	-932.6			
Indane	lq	11.5	150.8	56.0	190.3
1 <i>H</i> -Indazole	c	151.9			
Indene	lq	110.6	217.6	215.3	186.9
1 <i>H</i> -Indole	c	86.7			
Indole-2,3-dione	c	-268.2			
Iodoacetone	g	-130.5			
Iodobenzene	lq	117.1		205.4	158.7
	g	164.9	187.8	334.1	100.8
2-Iodobenzoic acid	c	-302.3			
3-Iodobenzoic acid	c	-316.9			
4-Iodobenzoic acid	c	-316.1			
Iodocyclohexane	lq	-97.2			
Iodoethane	lq	-40.0	14.7	211.7	115.1
	g	-8.1	19.2	306.0	66.9
Iodoethylene	g			285.0	57.9
Iodomethane	g	14.4	15.6	254.1	44.1
2-Iodo-2-methylpropane	lq	-107.5			162.3
	g	-72.0	23.6	342.2	118.3
1-Iodonaphthalene	lq	161.5			
2-Iodonaphthalene	c	144.3			
2-Iodophenol	c	-95.8			
3-Iodophenol	c	-94.5			

TABLE 6.1 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of Organic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ·mol ⁻¹	$\Delta_f G^\circ$ kJ·mol ⁻¹	S° J·deg ⁻¹ ·mol ⁻¹	C_p° J·deg ⁻¹ ·mol ⁻¹
4-Iodophenol	c	-95.4			
1-Iodopropane	lq	-66.0			126.8
	g	-30.0			
2-Iodopropane	lq	-74.8			91.0
	g	-40.3	20.1	324.5	90.1
3-Iodopropanoic acid	c	-460.0			
3-Iodo-1-propene	g	91.5			
α -Iodotoluene	lq	57.7			
3-Iodotoluene	lq	79.1			
4-Iodotoluene	lq	67.4			
Isobutanenitrile	g	25.4	103.6	313.3	96.4
Isobutylamine	lq	-132.6			183.2
Isobutylbenzene	lq	-69.8			
Isobutyl trichloroacetate	lq	-553.4			
Isocyanomethane	g	163.5	165.7	246.9	52.9
(-)-Isoleucine	c	-637.9	-347.2	208.0	188.3
(±)-Isoleucine	c	-635.3			
Isoxazole	g	78.6			
Isopropenyl acetate	lq	-386.4			
Isopropyl acetate	lq	-518.9			199.4
Isopropylamine	lq	-112.3		218.3	163.8
	g	-83.7	32.2	312.2	97.5
Isopropylbenzene	lq	-41.1	124.3	279.8	210.7
	g	4.0	137.0	388.6	151.7
1-Isopropyl-2-methylbenzene	lq	-73.3			
1-Isopropyl-3-methylbenzene	lq	-78.6			
1-Isopropyl-4-methylbenzene	lq	-78.0	119.1	306.6	
Isopropyl methyl ether	lq	-278.8		253.8	161.9
	g	-252.0	-120.9	332.3	111.1
2-Isopropyl-5-methylphenol	c	-309.7			
Isopropyl methyl sulfide	lq	-105.7		263.1	172.4
	g	-90.5	13.4	359.3	117.2
Isopropyl nitrate	g	-191.0	-40.7	373.2	120.7
2-Isopropylphenol	lq	-233.7			
3-Isopropylphenol	lq	-252.5			
4-Isopropylphenol	lq	-265.9			
Isopropyl thioacetate	lq	-298.2			
Isopropyl trichloroacetate	lq	-536.0			
Isoquinoline	c	144.5			
	lq				196.8
Ketene	g	-47.5	-48.3	247.6	51.8
(+)-Lactic acid	c	-694.1	-522.9	142.3	
(±)-Lactic acid	lq	-674.5	-518.2	192.1	
β -Lactose	c	-2236.7	-1567.0	386.2	
(+)-Leucine	c	-637.3	-347.2	208.0	
(-)-Leucine	c	-637.4	-346.3	211.8	201.0
(+)-Limonene	lq	-54.5			249.0
(±)-Lysine	c	-678.6			
Malic acid	c	-789.4	-625.1	160.8	137.0
Maleic anhydride	c	-469.8			
(R)-Malic acid	c	-1105.7			
(S)-Malic acid	c	-1103.6			

TABLE 6.1 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of Organic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ·mol ⁻¹	$\Delta_f G^\circ$ kJ·mol ⁻¹	S° J·deg ⁻¹ ·mol ⁻¹	C_p° J·deg ⁻¹ ·mol ⁻¹
Malonamide	c	-546.0			
Malonic acid	c	-891.0			
Malonodiamide	c	-546.1			
Malononitrile	c	186.6			
D-(+)-Maltose	c	-2220.9	-1726.3		
(±)-Mandelic acid	c	-579.4			
(+)-Mannitol	c	-1337.1	-942.2	238.5	
D-(+)-Mannose	c	-1263.0			
2-Mercaptopropanoic acid	lq	-468.2	-343.9	228.9	
Methane	g	-74.6	-50.5	186.3	35.7
Methane- <i>d</i> ₄	g	-88.2	-59.5	198.9	40.3
Methanethiol	lq	-46.7	-7.7	169.2	90.5
	g	-22.9	-9.9	255.1	50.3
Methanol	lq	-239.1	-166.6	126.8	81.2
	g	-201.0	-162.3	239.9	44.1
(-)-Methionine	c	-577.5	-505.8	231.5	
2-Methoxybenzaldehyde	c	-266.5			
3-Methoxybenzaldehyde	lq	-276.1			
4-Methoxybenzaldehyde	lq	-267.2			
Methoxybenzene	lq	-114.8			199.0
	g	-67.9			
2-Methoxybenzoic acid	c	-538.5			
3-Methoxybenzoic acid	c	-553.5			
4-Methoxybenzoic acid	c	-561.7			
2-Methoxyethanol	lq				171.1
2-Methoxyethyl acetate	lq				310.0
2-Methoxytetrahydropyran	lq	-442.3			
5-Methoxytetrazole	c	69.1			
1-Methoxy-2,4,6-trinitrobenzene	c	-157.5			
Methyl (CH ₃)	g	145.7	147.9	194.2	38.7
Methyl acetate	lq	-445.8			141.9
	g	-413.3		324.4	86.0
Methyl acrylate	lq	-362.2	-243.2	239.5	158.8
	g	-333.0	-237.6		
Methylamine	lq	-47.2	35.7	150.2	102.1
	g	-22.5	32.7	242.9	50.1
<i>N</i> -Methylaniline	lq	32.2			207.1
<i>o</i> -Methylaniline	lq	-6.3			209.6
	g	56.4	167.6	351.0	130.2
<i>m</i> -Methylaniline	lq	-8.1			227.0
	g	54.6	165.4	352.5	125.5
<i>p</i> -Methylaniline	lq	-23.5			
	g	55.3	167.7	347.0	126.2
Methyl benzoate	lq	-343.5			221.3
2-Methylbenzoic acid	c	-416.5			
	lq				174.9
3-Methylbenzoic acid	c	-426.1			
	lq				163.6
4-Methylbenzoic acid	c	-429.2			
	lq				169.0

TABLE 6.1 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of Organic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ·mol ⁻¹	$\Delta_f G^\circ$ kJ·mol ⁻¹	S° J·deg ⁻¹ ·mol ⁻¹	C_p° J·deg ⁻¹ ·mol ⁻¹
2-Methylbenzoic anhydride	c	-533.5			
4-Methylbenzoic anhydride	c	-520.9			
1-Methylbicyclo[4.1.0]heptane	lq	-59.9			
1-Methylbicyclo[3.1.0]hexane	lq	-33.2			
2-Methylbiphenyl	lq	108.0			
3-Methylbiphenyl	lq	85.4			
4-Methylbiphenyl	c	55.2			
2-Methyl-1,3-butadiene	lq	48.2		229.3	152.6
	g	75.5	145.9	315.6	104.6
3-Methyl-1,2-butadiene	g	129.7	198.6	319.7	105.4
2-Methylbutane	lq	-178.4		260.4	164.8
	g	-154.0	-14.8	343.6	118.8
2-Methyl-2-butanethiol	lq	-162.8		290.1	198.1
	g	-127.1	9.2	386.9	143.5
3-Methyl-1-butanethiol	g	-114.9			
3-Methyl-2-butanethiol	lq	-158.8			
2-Methylbutanoic acid	lq	-554.4			
3-Methylbutanoic acid	lq	-561.6			197.1
2-Methyl-1-butanol	lq	-356.6			220.1
3-Methyl-1-butanol	lq	-356.4			210.0
2-Methyl-2-butanol	lq	-379.5	-175.3	229.3	247.1
(±)-3-Methyl-2-butanol	lq	-366.6			232.2
3-Methyl-2-butanone	lq	-299.5		268.5	179.9
	g	-262.5			
2-Methyl-1-butene	lq	-61.1		254.0	157.2
	g	-35.3	65.6	339.5	110.0
3-Methyl-1-butene	lq	-51.5		253.3	156.1
	g	-27.6	74.8	333.5	118.6
2-Methyl-2-butene	lq	-68.6		251.0	152.8
	g	-41.8	59.7	338.6	105.0
<i>trans</i> -2-Methyl-2-butenedioic acid [also <i>cis</i>]	c	-824.4			
<i>cis</i> -2-Methyl-2-butenedioic acid	c	-455.6			
<i>trans</i> -2-Methyl-2-butenedioic acid	c	-490.8			
3-Methylbutyl acetate	lq				248.5
3-Methyl-1-butyne	g	136.4	205.5	319.0	104.7
Methyl <i>trans</i> -2-butenolate	lq	-382.8			
Methylcyclobutane	lq	-44.5			
Methylcyclobutanecarboxylic acid	lq	-395.0			
Methylcyclohexane	lq	-190.1	20.3	247.9	184.9
	g	-154.7	27.3	343.3	135.0
<i>cis</i> -2-Methylcyclohexanol	lq	-390.2			200 ¹⁷
<i>trans</i> -2-Methylcyclohexanol	lq	-415.8			200 ¹⁷
<i>cis</i> -3-Methylcyclohexanol	lq	-416.1			292 ¹⁷
<i>trans</i> -3-Methylcyclohexanol	lq	-394.4			202 ¹⁷
<i>cis</i> -4-Methylcyclohexanol	lq	-413.2			202 ¹⁷
<i>trans</i> -4-Methylcyclohexanol	lq	-433.3			202 ¹⁷
2-Methylcyclohexene	lq	-81.2			
Methylcyclopentane	lq	-138.0	31.5	247.9	158.7
	g	-106.2	35.8	339.9	109.8

TABLE 6.1 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of Organic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ·mol ⁻¹	$\Delta_f G^\circ$ kJ·mol ⁻¹	S° J·deg ⁻¹ ·mol ⁻¹	C_p° J·deg ⁻¹ ·mol ⁻¹
1-Methylcyclopentanol	lq	-343.3			
2-Methylcyclopentanone	lq	-265.3			
1-Methylcyclopentene	g	-3.8	102.1	326.4	100.8
3-Methylcyclopentene	g	7.4	115.0	330.5	100.0
4-Methylcyclopentene	g	14.6	121.6	328.9	100.0
1-Methylcyclopropene	lq	1.7			
	g	243.6			
Methylenecyclobutane	g	121.6			
Methylenebutanedioic acid	c	-841.1			
Methylenecyclohexane	lq	-61.3			
Methylenecyclohexene	lq	-12.7			
Methylenecyclopropane	g	200.5			
Methyl decanoate	lq	-640.4			
Methyl 2,2-dimethylpropanoate	lq	-530.0			257.9
2-Methyl-1,3-dioxane	lq	-436.4			
4-Methyl-1,3-dioxane	c	416.1			
N-Methyldiphenylamine	lq	120.5			
4-Methyldiphenylamine	c	49.0			
Methyl dodecanoate	lq	-693.0			
Methylene (CH ₂)	g	390.4	372.9	194.9	33.8
Methylenebutanedioic acid	c	-841.1			
Methylenecyclohexane	lq	-61.3			
2-Methylenecyclohexanol	lq	-277.6			
3-Methylenecyclohexene	lq	-12.7			
2-Methylenecyclopentanol	lq	46.9			
Methylenecyclopropane	g	200.5			
Methylenesuccinic acid	c	-841.2			
Methylene sulfate	c	-688.7			
N-Methylformamide	lq				123.8
Methyl formate	lq	-386.1			119.1
	g	-357.4	-297.2	285.3	64.4
Methyl 2-furancarboxylate	lq	-450.0			
2-Methyl-2,5-furandione	lq	-504.5			
α -Methyl-(+)-glucoside	c	-1233.4			
N-Methylglycine	c	-513.3			
Methylglyoxal	g	-27.1			
Methylglyoxime	c	-126.8			
2-Methylheptane	lq	-255.0		356.4	252.0
	g	-215.4	12.8	452.5	
3-Methylheptane	lq	-252.3		362.6	250.2
	g	-212.5	13.7	461.6	
4-Methylheptane	lq	-251.6			251.1
	g	-212.0	16.7	453.3	
Methyl heptanoate	lq	-567.1			285.1
2-Methylhexane	lq	-229.5		323.3	222.9
	g	-194.6	3.2	420.0	166.0
3-Methylhexane	lq	-226.4			214.2
	g	-192.3	4.6	424.1	166.0
Methyl hexanoate	lq	-540.2			
5-Methyl-1-hexene	g	-65.7			
cis-3-Methyl-3-hexene	g	-79.4			

TABLE 6.1 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of Organic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ·mol ⁻¹	$\Delta_f G^\circ$ kJ·mol ⁻¹	S° J·deg ⁻¹ ·mol ⁻¹	C_p° J·deg ⁻¹ ·mol ⁻¹
<i>trans</i> -3-Methyl-3-hexene	g	-76.8			
Methylhydrazine	lq	54.2	179.9	165.9	134.9
	g	94.7	186.9	278.7	71.1
2-Methyl-1 <i>H</i> -indole	c	60.7			
3-Methyl-1 <i>H</i> -indole	c	68.2			
Methyl isocyanate	lq	-92.0			
Methyl isocyanide	g	163.5	165.7	246.8	52.9
1-Methyl-4-isopropylbenzene	lq	-78.0			236.4
Methyl isopropyl sulfide	g	-90.4	13.4	359.3	117.2
Methyl isothiocyanate	c	79.4			
	g	131.0	144.4	252.3	65.5
5-Methylisoxazole	lq	-5.6			
Methylmercury bromide	c	-86.2			
Methylmercury chloride	c	-116.3			
Methylmercury iodide	c	-43.5			
Methyl 2-methylbutanoate	lq	-534.3			
Methyl 3-methylbutanoate	lq	-538.9			
7-Methyl-3-methylene-1,6-octadiene	lq	14.5			
(<i>R</i>)-1-Methyl-4-(1-methylethenyl)cyclohexene	lq	-54.5			249 ²⁰
1-Methylnaphthalene	lq	56.3	189.4	254.8	224.4
2-Methylnaphthalene	c	44.9	192.6	220.0	196.0
	g	106.7	216.2	380.0	159.8
Methyl nitrate	lq	-156.3	-43.5	217.2	157.3
	g	-124.4	-39.3	318.5	76.5
Methyl nitrite	g	-66.1	1.0	284.3	63.2
Methyl nitroacetate	lq	-464.0			
2-Methyl-5-nitroaniline	c	-91.3			
4-Methyl-3-nitroaniline	c	-71.7			
1-Methyl-2-nitrobenzene	lq	-9.7			
1-Methyl-3-nitrobenzene	lq	-31.5			
1-Methyl-4-nitrobenzene	c	-48.1			
2-Methyl-2-nitropropane	c	-229.8			
2-Methyl-2-nitro-1,3-propanediol	c	-575.3			
2-Methyl-2-nitro-1-propanol	c	-410.0			
2-Methylnonane	lq	-309.8		420.1	313.3
5-Methylnonane	lq	-307.9		423.8	314.4
Methyl phenylcarbamate	c	-186.7			
Methyl <i>cis</i> -9-octadecanoate	lq	-734.5			
Methyl octanoate	lq	-590.3			
2-Methyl-2-oxazoline	g	-130.5			
2-Methylpentane	lq	-204.6		290.6	193.7
	g	-174.8	-5.0	380.5	144.2
3-Methylpentane	lq	-202.4		292.5	190.7
	g	-172.1	2.1	379.8	143.1
2-Methyl-2,4-pentanediol	lq				236.0
Methyl pentanoate	lq	-514.2			229.3
2-Methyl-1-pentanol	lq				248.0
2-Methyl-3-pentanol	lq	-396.4			

TABLE 6.1 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of Organic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ·mol ⁻¹	$\Delta_f G^\circ$ kJ·mol ⁻¹	S° J·deg ⁻¹ ·mol ⁻¹	C_p° J·deg ⁻¹ ·mol ⁻¹
3-Methyl-2-pentanol	lq				275.9
3-Methyl-3-pentanol	lq				293.4
4-Methyl-2-pentanol	lq	-394.7			273.0
2-Methyl-3-pentanone	lq	-325.9			
4-Methyl-2-pentanone	lq				213.3
2-Methyl-1-pentene	g	-59.4	77.6	382.2	135.6
2-Methyl-2-pentene	g	-66.9	71.2	378.4	126.6
3-Methyl-1-pentene	g	-49.5	86.4	376.8	142.4
<i>cis</i> -3-Methyl-2-pentene	g	-62.3	73.2	378.4	126.6
<i>trans</i> -3-Methyl-2-pentene	g	-63.1	71.3	381.8	126.6
4-Methyl-1-pentene	g	-51.3	90.0	367.7	126.5
<i>cis</i> -4-Methyl-2-pentene	g	-57.5	82.1	373.3	133.6
<i>trans</i> -4-Methyl-2-pentene	g	-61.5	79.6	368.3	141.4
Methyl 2-methylpropenoate	lq				191.2
4-Methyl-3-penten-2-one	lq				212.5
Methyl pentyl sulfide	g	122.9	35.1	450.7	163.7
3-Methyl-1-phenyl-1-butanone	lq	-220.2			
Methyl phenyl sulfide	lq	43.0			
Methyl phenyl sulfone	c	-345.4			
Methylphosphonic acid	c	-1054			
(±)-2-Methylpiperidine	lq	-124.9			
2-Methylpropanal	lq	-247.4			
	g	-215.8			
<i>N</i> -Methylpropanamide	lq				179
2-Methylpropanamine	lq	-132.6			183.2
2-Methylpropane	g	-134.2	-20.9	294.6	130.5 ⁻¹²
2-Methyl-1,2-propanediamine	lq	-133.9			
2-Methyl-1,2-propanediol	lq	-539.7			
2-Methylpropanenitrile	lq	-13.8			
2-Methyl-1-propanethiol	g	-97.3	5.6	362.9	118.3
2-Methyl-2-propanethiol	g	-109.6	0.7	338.0	121.0
2-Methylpropanoic acid	lq				173
2-Methyl-1-propanol	lq	-334.7		214.7	181.2
	g	-283.9	-167.35	359.0	111.3
2-Methyl-2-propanol	lq	-359.2		193.3	219.8
	g	-312.5	-177.7	326.7	113.6
2-Methylpropene	g	-16.9	58.1	293.6	89.1
2-Methylpropenoic acid	lq				161.1
1-Methyl-2-propylbenzene	lq	-72.5			
1-Methyl-3-propylbenzene	lq	-76.2			
1-Methyl-4-propylbenzene	lq	-75.1			
(2-Methylpropyl)benzene	lq	-69.8			240.6
Methyl propyl ether	lq	-266.0		262.9	165.4
	g	-238.2	-109.9	349.5	112.5
Methyl propyl sulfide	g	-82.3	18.4	371.7	117.4
2-Methylpyridine	lq	56.7	166.5	217.9	158.4
	g	99.2	177.1	325.0	100.0
3-Methylpyridine	lq	61.9	214.0	216.3	158.7
	g	106.4	184.3	325.0	99.6
4-Methylpyridine	lq	59.2		209.1	159.0
1-Methyl-1 <i>H</i> -pyrrole	lq	62.4			

TABLE 6.1 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of Organic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ·mol ⁻¹	$\Delta_f G^\circ$ kJ·mol ⁻¹	S° J·deg ⁻¹ ·mol ⁻¹	C_p° J·deg ⁻¹ ·mol ⁻¹
2-Methyl-1 <i>H</i> -pyrrole	lq	23.3			
3-Methyl-1 <i>H</i> -pyrrole	lq	20.5			
<i>N</i> -Methylpyrrolidone	lq	-262.2			307.8
2-Methylquinoline	c	164.4			
Methyl salicylate	lq	-531.8			249.0
Methylsilane	g			256.5	65.9
α -Methylstyrene	g	113.0	208.5	383.7	145.2
<i>cis</i> -(β)-Methylstyrene	g	121.3	216.9	383.7	145.2
<i>trans</i> -(β)-Methylstyrene	g	117.2	213.7	380.3	146.0
Methylsuccinic acid	c	-958.2			
Methylsuccinic anhydride	lq	-617.6			
Methyl tetradecanoate	lq	-743.9			
2-Methylthiacyclopentane	g	-63.3			
4-Methylthiazole	lq	68.0			
Methylthiirane	g	45.8			
2-Methylthiophene	lq	44.6			149.8
	g	83.5	122.9	320.6	95.4
3-Methylthiophene	lq	43.1			
	g	82.6	121.8	321.3	94.9
Methyl <i>p</i> -tolyl sulfone	c	-372.8			
5-Methyluracil	c	-462.8			
Methylurea	c	-332.8			
Morphine monohydrate	c	-711.7			
Morpholine	lq				164.8
Murexide	c	-1212.1			
Naphthalene	c	77.9	201.6	167.4	165.7
	g	150.6	224.1	333.1	131.9
1-Naphthaleneacetic acid	c	-359.2			
2-Naphthaleneacetic acid	c	-371.9			
1-Naphthoic acid	c	333.5			
2-Naphthoic acid	c	-346.1			
1-Naphthol	c	-121.0			166.9
2-Naphthol	lq	-124.2			
1,4-Naphthoquinone	c	-183.4			
1-Naphthyl acetate	c	-288.2			
2-Naphthyl acetate	c	-304.3			
1-Naphthylamine	c	67.8			
2-Naphthylamine	c	59.7			
Nicotine	lq	39.3			
Nitrilotriacetic acid	c	-1311.9	-1307.5		
Nitroacetone	lq	-278.6			
2-Nitroaniline	c	-26.1	178.2	176.2	166.0
3-Nitroaniline	c	-38.3	174.1	176.2	158.8
4-Nitroaniline	c	-42.0	151.0	176.2	167.0
Nitrobenzene	lq	12.5	146.2	224.3	185.8
2-Nitrobenzoic acid	c	-378.5	-196.4	208.4	
3-Nitrobenzoic acid	c	-394.7	-220.5	205.0	
4-Nitrobenzoic acid	c	-392.2	-222.0	210.0	181.2
3-Nitrobiphenyl	c	65.1			
4-Nitrobiphenyl	c	40.5			
1-Nitrobutane	g	-143.9	10.1	394.5	124.9

TABLE 6.1 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of Organic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ·mol ⁻¹	$\Delta_f G^\circ$ kJ·mol ⁻¹	S° J·deg ⁻¹ ·mol ⁻¹	C_p° J·deg ⁻¹ ·mol ⁻¹
2-Nitrobutane	g	-163.6	-6.2	383.3	123.5
3-Nitro-2-butanol	lq	-390.0			
N-Nitrodiethylamine	lq	-106.2			
2-Nitrodiphenylamine	c	64.4			
Nitroethane	lq	-143.9			134.4
	g	-102.3	-4.9	315.4	78.2
2-Nitroethanol	lq	-350.7			
2-Nitrofuran	c	-104.1			
5-Nitrofurancarboxylic acid	c	-516.8			
1-Nitroguanidine	c	-92.4			
Nitromethane	lq	-113.1	-14.4	171.8	106.6
	g	-74.3	-6.8	275.0	57.3
(Nitromethyl)benzene	lq	-22.8			
1-Nitronaphthalene	c	42.6			
1-Nitroso-2-naphthol	c	-50.5			
2-Nitroso-1-naphthol	c	-61.8			
4-Nitroso-1-naphthol	c	-107.8			
1-Nitropropane	lq	-167.2			175.3
	g	-123.8			
2-Nitropropane	lq	-180.3			170.3
	g	-139.0			
1-Nitro-2-propanone	c	-294.7			
4-Nitrosodiphenylamine	c	213.0			
β -Nitrostyrene	c	30.5			
4-Nitrotoluene	c	-48.1			172.3
Nonadecane	g	-435.1	108.9	895.2	440.4
1-Nonadecene	g	-309.6	196.7	891.0	429.7
1-Nonanal	g	-310.3	-74.9	539.6	216.8
Nonane	lq	-274.7			284.4
	g	-228.2	24.8	505.7	211.7
1-Nonanethiol	g	-190.8	53.0	571.2	232.7
Nonanoic acid	lq	-659.7			362.4
1-Nonanol	g	-376.3	-110.5	558.6	224.3
2-Nonanone	lq	-397.2			
5-Nonanone	lq	-398.2		401.4	303.6
1-Nonene	g	-103.5	112.7	501.5	201.0
Norleucine	c	-639.1			
Octadecane	c	-567.4		480.2	485.6
	g	-414.6	100.5	856.2	417.6
Octadecanoic acid	c	-947.7			501.5
1,8-Octadecanoic acid	c	-1038.1			
1-Octadecene	g	-289.0	188.3	852.0	406.8
cis-9-Octadecenoic acid	lq	-743.5			577.0 ⁵⁰
trans-9-Octadecenoic acid	c	-910.9			
1,7-Octadiyne	lq	334.4			
Octafluorocyclobutane	lq				209.8 ⁻⁶
	g	-1542.6	-1398.8	400.4	156.2
Octafluoropropane	g	-1783.1			
Octafluorotoluene	lq	-1311.1		355.5	262.3
1-Octanal	g	-289.6	-83.3	500.7	194.0
Octanamide	c	-473.2			

TABLE 6.1 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of Organic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ·mol ⁻¹	$\Delta_f G^\circ$ kJ·mol ⁻¹	S° J·deg ⁻¹ ·mol ⁻¹	C_p° J·deg ⁻¹ ·mol ⁻¹
Octane	lq	-250.1			254.6
	g	-208.6	16.4	466.7	188.9
1-Octanenitrile	lq	-107.3			
1-Octanethiol	g	-44.9	44.6	582.2	209.8
Octanoic acid	lq	-636.0			297.9
1-Octanol	lq	-426.5	-143.1	377.4	305.1
2-Octanol	lq				330.1
2-Octanone	lq	-384.5	-140.3	373.8	273.3
1-Octene	lq	-121.8			241.0
	g	-81.4	104.2	462.5	178.1
<i>cis</i> -2-Octene	lq	-135.7			239.0
<i>trans</i> -2-Octene	lq	-135.7			239.0
1-Octyne	g	82.4	235.4	496.6	174.0
(±)-Ornithine	c	-652.7			
Oxalic acid	c	-821.7	-697.9	109.8	91.0
Oxalic acid dihydrate	c	-1492.0			
Oxaloyl dichloride	lq	-367.6			
Oxaloyl dihydrazide	c	-295.2			
Oxamic acid	c	-661.2			
Oxamide	c	-504.4	-342.7	118.0	
Oxazole	g	-5.5			
2-Oxetanone	lq	-329.9		175.3	122.1
Oxindole	c	-172.4			
2-Oxohexamethyleneimine	c	-329.4	-95.1	168.6	156.8
Oxomethyl (HCO)	g	43.1	28.0	224.7	34.6
2-Oxo-1,5-pentanedioic acid	c	-1026.2			
4-Oxopentanoic acid	c	-697.1			
2-Oxopropanoic acid	lq	-584.5	-463.4	179.5	
8-Oxypurine	c	-64.4			
Papaverine	c	-502.3			
Paraformaldehyde	c	-177.6			
Paraldehyde	lq	-687.0			
Pentachloroethane	lq	-187.6			173.8
	g	-142.0	-70.3	381.5	118.1
Pentachlorofluoroethane	g	-317.2	-234.0	391.8	
Pentachlorophenol	c	-292.4	-144.1	251.9	202.0
Pentacyclo[4.2.0.0 ^{2,5} .0 ^{3,8} .0 ^{4,7}]-octane	c	541.8			
Pentadecane	g	-352.8	75.2	739.4	349.0
Pentadecanoic acid	c	-861.7			443.3
1-Pentadecene	g	-227.2	163.1	735.2	338.2
1-Pentadecyne	g	-61.8	293.9	719.3	33.41
1,2-Pentadiene	g	140.7	210.4	333.5	105.4
<i>cis</i> -1,3-Pentadiene	g	81.5	145.8	324.3	94.6
<i>trans</i> -1,3-Pentadiene	g	76.5	146.73	319.7	103.3
1,4-Pentadiene	g	105.7	170.3	333.5	105.0
2,3-Pentadiene	g	133.1	205.9	324.7	101.3
Pentaerythritol	c	-920.6	-613.8	198.1	190.4
Pentaerythritol tetranitrate	c	-538.6			
Pentafluorobenzoic acid	c	-1239.6			
Pentafluoroethane	g	-1104.6	-1029.3	333.7	95.7

TABLE 6.1 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of Organic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ·mol ⁻¹	$\Delta_f G^\circ$ kJ·mol ⁻¹	S° J·deg ⁻¹ ·mol ⁻¹	C_p° J·deg ⁻¹ ·mol ⁻¹
Pentafluorophenol	c	-1024.1			
2,3,4,5,6-Pentafluorotoluene	lq	-883.8		306.4	225.8
Pentamethylbenzene	c	-133.6			
	g	-74.5	123.3	443.9	216.5
Pentamethylbenzoic acid	c	-536.1			
Pentanal	g	-228.5	-108.3	383.0	125.4
Pentanamide	c	-379.5			
1-Pentanamine	lq				218.0
Pentane	lq	-173.5	-9.3	262.7	167.2
	g	-146.9	-8.4	349.0	120.2
1,5-Pentanediol	lq	-531.5			321.3
2,4-Pentanedione	lq	-423.8			208.2
	g	-380.6		397.9	120.1
1,5-Pentanedithiol	g	-71.0			
Pentanenitrile	lq	-33.1			180
1-Pentanethiol	lq	-151.3			
Pentanoic acid	lq	-559.4		259.8	210.3
	g	-491.9	-357.2	439.8	
1-Pentanol	lq	-351.6			208.1
	g	-294.7	-146.0	402.5	133.1
2-Pentanol	lq	-365.2			
	g	-311.0			
3-Pentanol	lq	-368.9			239.7
	g	-311.4	-158.2	382.0	
2-Pentanone	lq	-297.3			184.1
	g	-259.0	-137.1	376.2	121.0
3-Pentanone	lq	-296.5		266.0	190.9
1-Pentene	lq	-46.0		262.6	154.0
	g	-21.2	79.1	345.8	109.6
<i>cis</i> -2-Pentene	lq	-53.7		258.6	151.7
	g	-27.6	71.8	346.3	101.8
<i>trans</i> -2-Pentene	lq	-58.2		256.5	157.0
	g	-31.9	69.9	340.4	108.5
<i>cis</i> -2-Pentenitrile	lq	71.8			
<i>trans</i> -2-Pentenitrile	lq	74.9			
<i>trans</i> -3-Pentenitrile	lq	80.9			
2-Pentenoic acid	lq	-446.4			
3-Pentenoic acid	lq	-434.8			
4-Pentenoic acid	lq	-430.6			
<i>cis</i> -3-Penten-1-yne	lq	226.5			
<i>trans</i> -3-Penten-1-yne	lq	228.2			
Pentyl acetate	lq				261.0
1-Pentyne	g	144.4	210.3	329.8	106.7
2-Pentyne	g	128.9	194.2	331.8	98.7
Perfluoropiperidine	lq	-2020.5	-1768.5	393.4	296.8
Perylene	c	182.8			
α -Phellandrene	lq	41.3			
Phenanthrene	c	116.2	268.3	215.1	220.6
9,10-Phenanthrenedione	c	-154.7			
Phenazine	c	237.0			
Phenol	c	-165.1	-50.4	144.0	127.4

TABLE 6.1 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of Organic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ·mol ⁻¹	$\Delta_f G^\circ$ kJ·mol ⁻¹	S° J·deg ⁻¹ ·mol ⁻¹	C_p° J·deg ⁻¹ ·mol ⁻¹
	lq				199.8 ⁴¹
	g	-96.4	-32.9	315.6	103.6
Phenoxyacetic acid	c	-513.8			
Phenyl acetate	lq	-334.9			
Phenylacetic acid	c	-398.7			
Phenylacetylene	g	327.3	363.5	321.7	114.9
(±)-3-Phenyl-2-alanine	c	-466.9	-211.7	213.6	203.0
Phenyl benzoate	c	-241.0			
Phenylboron dichloride	lq	-299.4			
1-Phenylcyclohexene	lq	-16.8			
Phenylcyclopropane	lq	100.3			
N-Phenyldiacetamide	c	-362.5			
1,3-Phenylenediamine	c	-7.8		154.5	159.6
Phenyl formate	lq	-268.7			
N-Phenylglycine	c	-402.5			
(±)-2-Phenylglycine	c	-431.8			
Phenylhydrazine	lq	141.0			217.0
Phenyl 2-hydroxybenzoate	c	-436.6			
Phenylmethanethiol	lq	43.5			
Phenylmethyl acetate	lq				148.5
N-Phenyl-2-naphthylamine	c	159.8			
1-Phenyl-1-propanone	lq	-167.2			
1-Phenyl-2-propanone	lq	-151.9			
1-Phenylpyrrole	c	154.3			
2-Phenylpyrrole	c	139.2			
Phenylsuccinic acid	c	-841.0			
S-Phenyl thioacetate	lq	-122.0			
Phenyl vinyl ether	lq	-26.2			
Phosgene	g	-220.9	-206.8	283.8	57.7
Phthalamide	c	-433.1			
1,2-Phthalic acid	c	-782.0	-591.6	207.9	188.3
1,3-Phthalic acid	c	-803.0			
1,4-Phthalic acid	c	-816.1			
Phthalic anhydride	c	-460.1	-331.0	180.0	160.0
Phthalonitrile	c	280.6			
Picric acid	c	-214.4			
α-Pinene	lq	-16.4			
β-Pinene	lq	-7.7			
Piperazine	c	-45.6	240.2	85.8	
2,5-Piperazinedione	c	-446.5			
Piperidine	lq	-86.4		210.0	179.9
2-Piperidone	c	-306.6	-112.1	164.9	(lq 307.8)
L-Proline	c	515.2			
Propadiene	g	190.5	202.4	243.9	59.0
Propanal	lq	-215.3			137.2
	g	-185.6	-130.5	304.5	80.7
Propanamide	c	-338.2			
Propane	lq				98.3 ⁻⁴³
	g	-103.8	-23.4	270.2	73.6
Propanediamide	c	-546.1			
(±)-1,2-Propanediamine	lq	-97.8			

TABLE 6.1 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of Organic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ·mol ⁻¹	$\Delta_f G^\circ$ kJ·mol ⁻¹	S° J·deg ⁻¹ ·mol ⁻¹	C_p° J·deg ⁻¹ ·mol ⁻¹
1,2-Propanediol	lq	-485.7			190.8
1,3-Propanediol	lq	-464.9			
1,2-Propanedione	lq	-309.1			
Propanedinitrile	lq	186.4			
1,2-Propanedithiol	lq	-79.4			
1,3-Propanedithiol	lq	-79.4			
Propanenitrile	lq	15.5	89.2	189.3	119.3
1-Propanethiol	lq	-99.9		242.5	144.6
	g	-67.9	2.2	336.4	94.8
2-Propanethiol	lq	-105.0		233.5	145.3
	g	-76.2	-2.6	324.3	96.0
1,2,3-Propanetriol tris(acetate)	lq	-1330.8		458.3	384.7
Propanoic acid	lq	-510.7	-383.5	191.0	152.8
Propanoic anhydride	lq	-679.1	-475.6		235.0
1-Propanol	lq	-302.6	-170.6	193.6	143.7
	g	-255.1	-161.8	322.7	85.6
2-Propanol	lq	-318.1	-180.3	181.1	155.0
	g	-272.6	-173.4	309.2	89.3
2-Propenal	g	-85.8	-64.6		
Propene	g	20.0	62.8	266.6	64.3
<i>trans</i> -1-Propene-1,2-dicarboxylic acid	c	-824.4			
2-Propenenitrile	lq	147.1			108.8
	g	180.6	195.4	274.1	63.8
<i>cis</i> -1,2,3-Propenetri-carboxylic acid	c	-1224.7			
<i>trans</i> -1,2,3-Propenetri-carboxylic acid	c	-1233.0			
2-Propenoic acid	lq	-383.8			145.7
	g	-336.5	-286.3	315.2	77.8
2-Propen-1-ol	lq	-171.8			138.9
	g	-124.5	-71.3	307.6	76.0
2-Propenyl acetate	lq	-386.2			184.1
<i>cis</i> -1-Propenylbenzene	g	121.3	216.9	383.7	145.2
<i>trans</i> -1-Propenylbenzene	g	117.2	213.7	380.3	146.0
2-Propenylbenzene	lq	88.0			
Propyl acetate	lq				196.2
Propylamine	lq	-101.5			162.5
	g	-70.2	39.8	325.1	91.2
Propylbenzene	lq	-38.3		287.8	214.7
	g	7.9	137.2	400.7	152.3
Propylcarbamate	c	-552.6			
Propylchloroacetate	lq	-515.6			
Propylchlorocarbonate	g	-492.7			
Propylcyclohexane	lq	-237.4		311.9	242.0
	g	-192.5	47.3	419.5	184.2
Propylcyclopentane	lq	-188.8		310.8	216.8
	g	-147.1	52.6	417.3	154.6
Propylene carbonate	lq	-613.2			218.6
Propylene oxide	lq	-123.0		196.5	120.4
	g	-94.7	-25.8	286.9	72.6

TABLE 6.1 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of Organic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ·mol ⁻¹	$\Delta_f G^\circ$ kJ·mol ⁻¹	S° J·deg ⁻¹ ·mol ⁻¹	C_p° J·deg ⁻¹ ·mol ⁻¹
Propyl formate	lq	-500.3			171.4
Propyl nitrate	g	-173.9	-27.3	385.4	121.3
S-Propyl thioacetate	lq	-294.1			
Propyl trichloroacetate	lq	-513.0			
Propyl vinyl ether	lq	-190.9			
2-Propynyl-1-amine	lq	205.7			
Propyne	g	184.9	194.4	248.1	60.7
2-Propynoic acid	lq	-193.2			
1 <i>H</i> -Purine	c	169.4			
Pyrazine	c	139.8			
1 <i>H</i> -Pyrazole	c	116.0			
	lq	105.4			
Pyrene	c	125.5		224.9	229.7
Pyridazine	lq	224.8			
Pyridine	lq	100.2	181.3	177.9	132.7
	g	140.4	190.2	282.8	78.1
3-Pyridinecarbonitrile	c	193.4			
3-Pyridinecarboxylic acid	c	-344.9			
Pyrimidine	lq	145.9			
1 <i>H</i> -Pyrrole	lq	63.1		156.4	127.7
Pyrrole-2-carboxaldehyde	c	-106.4			
Pyrrole-2-carboldoxime	c	12.1			
Pyrrolidine	lq	-41.0		204.1	156.6
	g	-3.6	114.7	309.5	81.1
(±)-2-Pyrrolidinecarboxylic acid	c	-524.2			
2-Pyrrolidone	c	-286.2			164.4
Quinhydrone	c	-82.8	-323.0	325.9	277.0
Quinidine	c	-160.3			
Quinine	c	-155.2			
Quinoline	lq	141.2	275.7	217.2	194.9
Raffinose	c	-3184			
L-(+)-Rhamnose	c	-1073.2			
D-(-)-Ribose	c	-1047.2			
Salicylaldehyde	lq	-279.9			222 ¹⁸
Salicylaldoxime	c	-183.7			
Salicylic acid	c	-589.5	-418.1	178.2	
Semicarbazide std. state	aq	-166.9	-40.6	297.9	
(-)-Serine	c	-732.7			
(±)-Serine	c	-739.0			
L-(-)-Sorbose	c	-1271.5	-908.4	220.9	
5,5'-Spirobis(1,3-dioxane)	c	-702.1			
Spiro[2.2]pentane	lq	157.5		193.7	134.5
	g	185.2	265.3	282.2	88.1
cis-Stilbene	lq	183.3			
trans-Stilbene	c	136.9	317.6	251.0	
(-)-Strychnine	c	-171.5			
Styrene	lq	103.8	202.4	237.6	182.0
	g	147.9	213.8	345.1	122.1
Succinic acid	c	-940.5	-747.4	167.3	153.1
Succinic acid monoamide	c	-581.2			

TABLE 6.1 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of Organic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ·mol ⁻¹	$\Delta_f G^\circ$ kJ·mol ⁻¹	S° J·deg ⁻¹ ·mol ⁻¹	C_p° J·deg ⁻¹ ·mol ⁻¹
Succinic anhydride	c	-608.6			
Succinimide	c	-459.0			
Succinonitrile	lq	139.7		191.6	145.6
(+)-Sucrose	c	-2226.1	-1544.7	360.2	
(±)-Tartaric acid	c	-1290.8			
(-)-Tartaric acid	c	-1282.4			
meso-Tartaric acid	c	-1279.9			
α-Terpinene	g	-20.5			
1,1,2,2,-Tetrabromoethane	lq				165.7
Tetrabromoethylene	g			387.1	102.7
Tetrabromomethane	c	29.4	47.7	212.5	144.3
	g	83.9	67.0	358.1	91.2
Tetrabutyltin	lq	-304.6			
Tetracene	c	158.8			
Tetrachloro-1,4-benzo-quinone	c	-288.7			
1,1,2,2,-Tetrachloro-1,2-difluoroethane	lq				178.6
	g	-489.9	-407.1	382.8	123.4
1,1,1,2-Tetrachloroethane	lq				153.8
	g	-149.4	-80.3	355.9	102.7
1,1,2,2,-Tetrachloroethane	lq	-195.0	-95.0	246.9	162.3
	g	-149.2	-85.6	362.7	100.8
Tetrachloroethylene	lq	-50.6			143.4
	g	-10.9	3.0	266.9	
Tetrachloromethane	lq	-128.2	-62.6	216.2	130.7
	g	-95.7	-53.6	309.9	83.4
1,1,1,3-Tetrachloropropane	lq	-207.8			
1,2,2,3-Tetrachloropropane	lq	-251.8			
1,1,2,2-Tetracyanocyclopropane	c	590			
Tetracyanoethylene	c	623.8			
Tetracyanomethane	c	611.6			
Tetradecane	g	-332.1	66.9	700.4	326.1
Tetradecanoic acid	c	-833.5			432.0
1-Tetradecanol	c	-629.6			388.0
1-Tetradecene	g	-206.5	154.8	696.2	315.3
Tetraethylene glycol	lq	-981.6			428.8
Tetraethylgermanium	lq	-210.5			
Tetraethyllead	lq	52.7	336.4	464.6	307.4
Tetraethylsilane	lq				298.1
Tetraethyltin	lq	-95.8			
1,1,1,2-Tetrafluoroethane	g	-895.8	-826.2	316.2	86.3
Tetrafluoroethylene	g	-658.9	-623.7	300.0	80.5
Tetrafluoromethane	g	-933.6	-888.3	261.6	61.0
2,2,3,3-Tetrafluoro-1-propanol	g	-1061.3			
Tetrahydrofuran	lq	-216.2		204.3	124.0
	g	-184.2		302.4	76.3
Tetrahydro-2-furanmethanol	lq	-435.6			181.2
1,2,3,4-Tetrahydronaphthalene	lq	-29.2			217
5,6,7,8-Tetrahydro-1-naphthol	c	-285.3			

TABLE 6.1 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of Organic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ·mol ⁻¹	$\Delta_f G^\circ$ kJ·mol ⁻¹	S° J·deg ⁻¹ ·mol ⁻¹	C_p° J·deg ⁻¹ ·mol ⁻¹
Tetrahydro-2 <i>H</i> -pyran	lq	-258.3			156.5
Tetrahydro-2 <i>H</i> -pyran-2-one	lq	-436.7			
1,2,3,6-Tetrahydropyridine	lq	33.5			
Tetrahydrothiophene	lq	-72.9			
	g	-34.1	-45.8	309.6	92.5
Tetrahydrothiophene-1,1-dioxide	lq				180 ²⁰
Tetraiodoethylene	c	305.0			
Tetraiodomethane	g	474.0	217.1	391.9	95.9
Tetramethylammonium bromide	c	-251.0			
Tetramethylammonium chloride	c	-276.4			
Tetramethylammonium iodide	c	-203.4			
1,2,3,4-Tetramethylbenzene	lq	-90.2	106.7	290.6	
1,2,3,5-Tetramethylbenzene	lq	-96.4	98.7	416.5	240.7
1,2,4,5-Tetramethylbenzene	c	-119.9	101.3	245.6	215.1
2,3,5,6-Tetramethylbenzoic acid	c	-506.1			
2,2,3,3-Tetramethylbutane	c	-269.0		273.7	239.2
	g	-225.6	22.0	389.4	192.5
1,1,2,2-Tetramethylcyclopropane	lq	-119.7			
Tetramethyllead	lq	97.9	262.8	320.1	
	g	135.9	270.7	420.5	144.0
2,2,3,3-Tetramethylpentane	lq	-278.3			271.5
2,2,3,4-Tetramethylpentane	lq	-277.7			
2,2,4,4-Tetramethylpentane	lq	-280.0			266.3
2,3,3,4-Tetramethylpentane	lq	-277.9			
Tetramethylsilane	lq	-264.0			204.1
	g	-239.1	-100.0	359.1	143.9
Tetramethylsuccinic acid	c	-1012.5			
Tetramethylthiacyclopropane	c	-83.0			
Tetramethyltin	g	-18.8			
Tetranitromethane	lq	38.4			
1,1,1,2-Tetraphenylethane	c	223.0			
1,1,2,2-Tetraphenylethane	c	216.0			
Tetraphenylethylene	c	311.5			
Tetraphenylhydrazine	c	457.9			
Tetraphenylmethane	c	247.1	574.0		
Tetraphenyltin	c	412.1			
Tetrapropylgermanium	g	-229.7			
Tetrapropyltin	lq	-211.3			
1,2,3,4-(1 <i>H</i>)-Tetrazole	c	237.0			
Theobromine	c	-361.5			
2-Thiaadamantane	c	-143.5			
Thiacyclobutane	g	60.6	107.1	285.0	68.3
Thiacycloheptane	g	-61.3	84.1	361.9	124.6
Thiacyclohexane	lq	-106.3		218.2	163.3
	g	-63.5	53.1	323.0	109.7
Thiacyclopentane	g	-33.8	46.0	309.4	90.9
Thiacyclopropane	g	82.2	96.9	255.3	53.7
Thianthrene	c	-182.5			
Thiirane	g	82.0	96.8	255.2	53.3

TABLE 6.1 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of Organic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ·mol ⁻¹	$\Delta_f G^\circ$ kJ·mol ⁻¹	S° J·deg ⁻¹ ·mol ⁻¹	C_p° J·deg ⁻¹ ·mol ⁻¹
Thiirene	g	300.0	275.8	255.3	54.7
Thioacetamide	c	-71.7			
Thioacetic acid	lq	-216.9			
	g	-175.1	-154.0	313.2	80.9
1,2-Thiocresol	lq	44.2			
Thiohydantoic acid	c	-554.8			
Thiohydantoin	c	-249.0			
2-Thiolactic acid	lq	-468.4			
Thiophene	lq	80.2	121.2	181.2	123.8
	g	115.0	126.8	278.9	72.9
Thiophenol	lq	64.1	134.0	222.8	173.2
	g	111.6	147.6	336.9	104.9
Thiosemicarbazide	c	25.1			
Thiourea	c	-89.1	21.8	115.9	
	g	22.9			
(-)-Threonine	c	-807.2			
(±)-Threonine	c	-758.8			
Thymine	c	-462.8			150.8
Thymol	c	-309.7			
Toluene	lq	12.4	113.8	221.0	157.0
	g	50.4	122.0	320.7	103.6
1 <i>H</i> -1,2,4-Triazol-3-amine	c	76.8			
2,4,6-Triamino-1,3,5-triazine	c	-72.4	184.5	149.1	
2-Triazoethanol	lq	94.6			
Tribenzylamine	c	140.6			
Tribromoacetaldehyde	lq	-130.3			
Tribromochloromethane	g	12.6	9.1	357.8	89.4
Tribromofluoromethane	g	-190.0	-193.1	345.9	84.4
Tribromomethane	lq	-28.5	8.0	220.9	130.7
	g	23.8	-5.0	330.9	71.2
Tributoxyborane	lq	-1199.6			
Tributylamine	lq	-281.6			
Tributyl phosphate	lq	-1456			
Tributylphosphine oxide	c	-460			
Trichloroacetaldehyde	lq	-234.5			151.0
2,2,2-Trichloroacetamide	c	-358.2			
Trichloroacetic acid	c	-503.3			
ionized	aq	-517.6			
Trichloroacetonitrile	g			336.6	96.1
Trichloroacetyl chloride	lq	-280.8			
Trichlorobenzoquinone	c	-269.9			
1,1,1-Trichloroethane	lq	-177.4		227.4	144.3
	g	-144.6	-76.2	323.1	93.3
1,1,2-Trichloroethane	lq	-191.5		232.6	150.9
	g	-151.2	-77.5	337.1	89.0
Trichloroethylene	lq	-43.6			124.4
	g	-9.0	19.9	324.8	80.3
Trichlorofluoromethane	lq	-301.3	-236.8	255.4	121.6
	g	-268.3	-249.3	309.7	78.0
Trichloromethane	lq	-134.5	73.7	201.7	114.2
	g	-102.7	-76.0	295.7	65.7

TABLE 6.1 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of Organic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ·mol ⁻¹	$\Delta_f G^\circ$ kJ·mol ⁻¹	S° J·deg ⁻¹ ·mol ⁻¹	C_p° J·deg ⁻¹ ·mol ⁻¹
1,2,2-Trichloropropane	g	-185.8	-97.8	382.9	112.2
1,2,3-Trichloropropane	lq	-230.6			183.6
	g	-182.9			
1,2,3-Trichloropropene	lq	-101.8			
1,1,2-Trichlorotrifluoroethane	lq	-805.8			170.1
1,1,1-Tricyanoethane	c	351.0			
Tricyanoethylene	c	439.3			
Tridecane	g	-311.5	58.5	661.5	303.2
Tridecanoic acid	c	-806.6			
1-Tridecene	g	-186.0	146.3	657.3	292.4
Triethanolamine	c	-664.2			389.0
Triethoxyborane	lq	-1047.4			
Triethoxymethane	lq	-687.3			
Triethylaluminum	lq	-236.8			
Triethylamine	lq	-127.7			219.9
	g	-92.8	110.3	405.4	160.9
Triethylaminoborane	lq	-198.6			
Triethyl arsenite	lq	-706.7			
Triethylarsine	lq	13.0			
Triethylbismuthine	lq	169.9			
Triethylborane	lq	-194.6	9.4	336.7	241.2
	g	-157.7	16.1	437.8	
Triethylenediamine	c	-14.2	239.7	157.6	
Triethylene glycol	lq	-804.2			
Triethyl phosphate	lq	-1243			
Triethylphosphine	lq	-89.1			
Triethyl phosphite	lq	-861.5			
Triethylstibine	lq	5.0			
Triethylsuccinic acid	c	-1066.5			
Triethyl thiophosphate	lq	-972.8			
Trifluoroacetic acid	lq	-1069.9			
Trifluoroacetonitrile	g	-497.9	-461.9	298.1	77.9
1,1,1-Trifluoroethane	g	-744.6	-678.3	279.9	78.2
1,1,2-Trifluoroethane	g	-730.7			
2,2,2-Trifluoroethanol	lq	-932.4			
Trifluoroethylene	g	-490.4	-469.5	292.6	69.2
Trifluoroiodoethane	g	-644.5			
Trifluoroiodomethane	g	-587.8	-572.0	307.5	70.9
Trifluoromethane	g	-695.4	-658.9	259.6	51.1
(Trifluoromethyl)benzene	g	-599.1	-511.3	372.6	130.4
1,1,1-Trifluoro-2,4-pentane-dione	lq	-1040.2			
3,3,3-Trifluoropropene	g	-614.2			
Trihexylamine	lq	-433.0			
(±)-Trihydroxyglutaric acid	c	-1490			
2,4,6-Trihydroxypyrimidine	c	-634.7			
Triiodomethane	g	251.0	178.0	356.2	75.1
Triisopropyl phosphite	lq	-980.3			
Trimethoxyborane	g	-899.1			
Trimethoxyethane	lq	-612.0			
Trimethoxymethane	lq	-570.0			

TABLE 6.1 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of Organic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ·mol ⁻¹	$\Delta_f G^\circ$ kJ·mol ⁻¹	S° J·deg ⁻¹ ·mol ⁻¹	C_p° J·deg ⁻¹ ·mol ⁻¹
Trimethylacetic acid	lq	-564.4			
Trimethylacetic anhydride	lq	-779.9			
2',4',5'-Trimethylacetophenone	lq	-252.3			
2',4',6'-Trimethylaceto-phenone	lq	-267.4			
Trimethylaluminum	lq	-136.4	-9.9	209.4	155.6
Trimethylamine	lq	-45.7		208.5	137.9
	g	-23.7	98.9	287.1	91.8
std. state	aq	-76.0	93.0	133.5	
Trimethylamine-aluminum chloride adduct	c	-879.1			
Trimethylamine-borane	c	-142.5	70.7	187.0	
Trimethylammonium ion, std. state	aq	-112.9	37.2	196.7	
Trimethyl arsenite	lq	-590.8			
Trimethylarsine	g	11.7			
1,2,3-Trimethylbenzene	lq	-58.5	107.5	267.8	216.4
1,2,4-Trimethylbenzene	lq	-61.8	102.3	284.2	215.0
1,3,5-Trimethylbenzene	lq	-63.4	103.9	273.6	209.3
2,3,4-Trimethylbenzoic acid	c	-486.6			
2,3,5-Trimethylbenzoic acid	c	-488.7			
2,3,6-Trimethylbenzoic acid	c	-475.7			
2,4,5-Trimethylbenzoic acid	c	-495.7			
2,4,6-Trimethylbenzoic acid	c	-477.9			
3,4,5-Trimethylbenzoic acid	c	-500.9			
2,6,6-Trimethylbicyclo-[3.1.1]-2-heptene	lq	16.4			
Trimethylbismuthine	g	192.9			
Trimethylborane	g	-124.3	-35.9	314.7	88.5
2,2,3-Trimethylbutane	g	-204.5	4.3	383.3	164.6
2,2,3-Trimethylbutane	lq	-236.5		292.2	213.5
2,3,3-Trimethyl-1-butene	lq	-117.7			
Trimethylchlorosilane	lq	-382.8	-246.4	278.2	
	g	-352.8	-243.5	369.1	
cis,cis-1,3,5-Trimethylcyclohexane	g	-215.4	33.9	390.4	179.6
1,1,2-Trimethylcyclopropane	lq	-96.2			
Trimethylene oxide (Oxetane)	lq	-110.8			
	g	-80.5	-9.8	273.9	
Trimethylgallium	g	-46.9			
2,3,5-Trimethylhexane	lq	-284.0			
Trimethylindium	g	170.7			
2,2,3-Trimethylpentane	lq	-256.9	9.3	327.6	188.9
	g	-220.0	17.1	425.2	
2,2,4-Trimethylpentane	lq	-259.2	6.9	328.0	239.1
	g	-224.0	13.7	423.2	
2,3,3-Trimethylpentane	lq	-253.5	10.6	334.4	245.6
	g	-216.3	18.9	431.5	
2,3,4-Trimethylpentane	lq	-255.0	10.7	329.3	247.3
2,2,4-Trimethyl-3-pentanone	lq	-381.6			
2,4,4-Trimethyl-1-pentene	lq	-145.9	86.4	306.3	

TABLE 6.1 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of Organic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ·mol ⁻¹	$\Delta_f G^\circ$ kJ·mol ⁻¹	S° J·deg ⁻¹ ·mol ⁻¹	C_p° J·deg ⁻¹ ·mol ⁻¹
2,4,4-Trimethyl-2-pentene	lq	-142.4	88.0	311.7	
Trimethylphosphine	lq	-122.2			
Trimethylphosphine oxide	c	-477.8			
Trimethyl phosphite	lq	-741.0			
Trimethylsilane	g			331.0	117.9
Trimethylsilanol	lq	-545.0			
Trimethylstibine	g	32.2			
Trimethylsuccinic acid	c	-1000.8			
Trimethylsuccinic anhydride	c	-688.3			
Trimethylthiacyclopropane	lq	-60.5			
Trimethyltin bromide	lq	-185.4			
Trimethyltin chloride	lq	-213.0			
Trimethylurea	c	-330.5			
Trinitroacetoneitrile	lq	183.7			
2,4,6-Trinitroanisole	c	-157.3			
1,3,5-Trinitrobenzene	c	-37.2			
1,1,1-Trinitroethane	lq	-96.9			
Trinitroglycerol	lq	-370.9			
Trinitromethane	lq	-32.8			
	g	-0.2			
2,4,6-Trinitrophenetole	c	-204.6			
2,4,6-Trinitrophenol	c	-214.3			
2,4,6-Trinitrophenylhydrazine	c	36.8			
2,4,6-Trinitrotoluene	c	-65.5			
2,4,6-Trinitro-1,3-xylene	c	-102.5			
Trioctylamine	lq	-584.9			
1,3,6-Trioxacyclooctane	lq	-515.9			
1,3,5-Trioxane	c	-522.5		133.0	114.4
Triphenylamine	c	234.7	504.2		
Triphenylarsine	c	310.0			
Triphenylbismuthine	c	469.0			
Triphenylborane	c	48.5			
Triphenylene	c	151.8	329.2	254.7	
1,1,1-Triphenylethane	c	157.2			
1,1,2-Triphenylethane	c	130.2			
Triphenylethylene	c	233.5	514.6		
2,4,6-Triphenylimidazole	c	272			
Triphenylmethane	c	171.2	412.5	312.1	295.0
Triphenylmethanol	c	-3.4	272.8	329.3	
Triphenyl phosphate	c	-757			
Triphenylphosphine	c	232.2			
Triphenylphosphine oxide	c	-60.3			
Triphenylstibine	c	329.3			
Tripropoxyborane	lq	-1127.2			
Tripropylamine	lq	-207.2			
Tripropynylamine	lq	814.2			
Tris(acetylacetonato)-chromium	c	-1533.0			
Tris(diethylamino)phosphine	lq	-289.5			
1,1,1-Tris(hydroxymethyl)-ethane	c	-744.6			

TABLE 6.1 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of Organic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ·mol ⁻¹	$\Delta_f G^\circ$ kJ·mol ⁻¹	S° J·deg ⁻¹ ·mol ⁻¹	C_p° J·deg ⁻¹ ·mol ⁻¹
Tris(hydroxymethyl)nitro-methane	c	-735.6			
Tris(isopropoxy)borane	lq	-293.3			
Tris(trimethylsilyl)amine	c	-725.1			
(-)-Tryptophane	c	-415.3	-119.4	251.0	238.2
(-)-Tyrosine	c	-685.1	-385.7	214.0	216.4
Undecane	lq	-327.2	22.8	458.1	344.9
Undecanoic acid	c	-735.9			
1-Undecanol	lq	-504.8			
1-Undecene	g	-144.8	129.5	579.4	246.7
10-Undecenoic acid	c	-577			
Uracil	c	-429.4			120.5
Urea	c	-333.1	-196.8	104.6	93.1
	g	-245.8			
Urea nitrate	c	-564.0			
Urea oxalate	c	-1528.4			
5-Ureidohydantoin	c	-718.0	-434.0	195.1	
Uric acid	c	-618.8	-358.8	173.2	166.1
(±)-Valine	c	-628.9	-359.0	178.9	168.8
Valylphenylalanine	c	-767.8			
Vinyl acetate	g	-314.4			
Vinylbenzene	lq	103.8			
Vinylcyclohexane	lq	-88.7			
4-Vinylcyclohexene	lq	26.8			
Vinylcyclopentane	lq	-34.8			
Vinylcyclopropane	lq	122.5			
2-Vinylpyridine	lq	157.1			
Xanthine	c	-379.6	-165.9	161.1	151.3
Xanthone	c	-191.5			
1,2-Xylene	lq	-24.4	110.3	246.5	186.1
	g	19.1	122.1	352.8	133.3
1,3-Xylene	lq	-25.4	107.7	252.2	183.3
	g	17.3	118.9	357.7	127.6
1,4-Xylene	lq	-24.4	110.1	247.4	181.5
	g	18.0	121.1	352.4	126.9
Xylitol	c	-1118.5			
D-(+)-Xylose	c	-1057.8			

TABLE 6.2 Heats of Fusion, Vaporization, and Sublimation and Specific Heat at Various Temperatures of Organic Compounds*Abbreviations Used in the Table* ΔH_m , enthalpy of melting (at the melting point) in $\text{kJ} \cdot \text{mol}^{-1}$ ΔH_v , enthalpy of vaporization (at the boiling point) in $\text{kJ} \cdot \text{mol}^{-1}$ ΔH_s , enthalpy of sublimation (or vaporization at 298 K) in $\text{kJ} \cdot \text{mol}^{-1}$ C_p , specific heat (at temperature specified on the Kelvin scale) for the physical state in existence (or specified: c, lq, g) at that temperature in $\text{J} \cdot \text{K}^{-1} \cdot \text{mol}^{-1}$ ΔH_t , enthalpy of transition (at temperature specified, superscript, measured in degrees Celsius) in $\text{kJ} \cdot \text{mol}^{-1}$

Substance	ΔH_m	ΔH_v	ΔH_s	C_p			
				400 K	600 K	800 K	1000 K
Acenaphthene	21.54	54.73	86.2				
Acenaphthylene			73.0				
Acetaldehyde	3.24	25.8	25.5	66.3(g)	85.9	101.3	112.5
Acetamide	15.71	56.1	78.7				
Acetanilide		64.7	80.8				
Acetic acid	11.54	23.7	23.4	79.7	106.2	125.5	139.3
Acetic anhydride	10.5	38.2	48.3	129.1	174.1	204.6	226.4
Acetone	5.69	29.1	31.0	92.1	122.8	144.9	162.0
Acetonitrile, $\Delta H_t = 0.22^{-56}$	8.17	29.8	32.9	61.2	76.8	89.0	98.3
Acetophenone		38.8	55.9				
Acetyl bromide			33.1				
Acetyl chloride			30.1	78.9	97.0	110.0	119.7
Acetylene	3.8	17.0	21.3	50.1	58.1	63.5	68.0
Acetylene- d_2				54.8	61.9	67.4	71.8
Acetylenedicarbonitrile			28.8	94.8	106.2	114.1	119.8
Acetyl fluoride			25.1				
Acetyl iodide			38.5				
Acrylic acid	11.16	44.1	54.3	96.0	123.4	142.0	155.3
Acrylonitrile	6.23	32.6	33.5	76.8	96.7	110.6	120.8
Adamantane			59.7				
Adenine			108.8				
α -Alanine			138.1				
Allyl <i>tert</i> -butyl sulfide			44.4				
Allyl ethyl sulfone			83.7				
Allyl ethyl sulfoxide			71.6				
Allyl methyl sulfone			79.5				
Allyl trichloroacetate			52.3				
3-Aminoacetophenone	12.1						
4-Aminoacetophenone	15.9						
2-Aminobenzoic acid	20.5		104.9				
3-Aminobenzoic acid	21.8		128.0				
4-Aminobenzoic acid	20.9		116.1				
2-Aminoethanol	20.5	50.9					
Aniline	10.56	42.4	55.8	143.0	192.8	225.1	230.9
Anthracene	28.83	56.5	101.5				
9,10-Anthraquinone		88.5	112.1				
<i>cis</i> -Azobenzene	22.04		92.9				
<i>trans</i> -Azobenzene	22.6	93.8					
Azobutane			49.3				
Azomethane				93.9	123.1	145.7	162.6
Azomethane- d_6				110.7	142.8	165.2	180.6

TABLE 6.2 Heats of Fusion, Vaporization, and Sublimation and Specific Heat at Various Temperatures of Organic Compounds (*Continued*)

Substance	ΔH_m	ΔH_v	ΔH_s	C_p			
				400 K	600 K	800 K	1000 K
Azoisopropane			36.0				
Azopropane			39.9				
<i>trans</i> -Azoxybenzene	17.93						
Azulene	12.1	55.5	76.8	176.4	248.2	295.4	327.4
Benzaldehyde	9.32	42.5	49.8				
Benzamide	18.49						
1,2-Benzanthracene			123.0				
2,3-Benzanthracene			126				
1,2-Benzanthracene-9,10-dione			82.8				
Benzene	9.95	30.7	33.8	113.5(g)	160.1	190.5	211.4
Benzeneacetic acid	14.49						
1,3-Benzenedicarboxylic acid			106.7				
1,4-Benzenedicarboxylic acid			98.3				
Benzenethiol	11.48	39.9	47.6				
Benzil	23.54						
Benzoic acid	18.06	50.6	91.1	138.4	196.7	234.9	260.7
Benzoic anhydride	17.2		96.4				
Benzonitrile	10.88	45.9	52.5	140.8	187.4	217.9	238.8
Benzo[<i>def</i>]phenanthrene	17.1		100.2				
Benzophenone	18.19		94.1				
1,4-Benzoquinone	18.53		62.8				
Benzo[<i>f</i>]quinoline			83.1				
Benzo[<i>h</i>]quinoline			80.8				
Benzo[<i>b</i>]thiophene, $\Delta H_t = 3.0^{-11.6}$	11.8						
Benzotrifluoride			37.6				
Benzoyl bromide			58.6				
Benzoyl chloride			54.8				
Benzoyl iodide			61.9				
4-Benzphenanthrene			106.3				
Benzyl acetate		49.4					
Benzyl alcohol	8.97	50.5	60.3				
Benzylamine			60.2				
Benzyl benzoate		53.6	77.8				
Benzyl bromide			47.3				
Benzyl chloride			51.5				
Benzyl ethyl sulfide			56.9				
Benzyl iodide			47.3				
Benzyl mercaptan			56.6				
Benzyl methyl ketone			49.0				
Benzyl methyl sulfide			53.6				
Bicyclo[1.1.0]butane			23.4				
Bicyclo[2.2.1]hepta-2,5-dione		32.9					
Bicyclo[2.2.1]heptane			40.2				
Bicyclo[4.1.0]heptane			38.0				
Bicyclo[2.2.1]-2-heptene			38.8				
Bicyclo[3.1.0]hexane			32.8				
Bicyclohexyl			58.0				
Bicyclo[2.2.2]octane			48.0				
Bicyclo[4.2.0]octane			42.0				
Bicyclo[5.1.0]octane			43.5				

TABLE 6.2 Heats of Fusion, Vaporization, and Sublimation and Specific Heat at Various Temperatures of Organic Compounds (*Continued*)

Substance	ΔH_m	ΔH_v	ΔH_s	C_p			
				400 K	600 K	800 K	1000 K
Bicyclo[2.2.2]-2-octene			43.8				
Bicyclopropyl			33.5				
Biphenyl	18.6	45.6	81.8	221.0	307.7	363.7	401.7
Biphenylene			84.3				
Bis(2-butoxyethyl) ether		55.9					
Bis(2-chloroethyl) ether	8.66	45.2					
Bis(2-ethoxyethyl) ether		49.0					
Bis(2-ethoxymethyl) ether		36.2	44.7				
Bis(2-hydroxyethyl) ether		52.3	57.3				
Bis(2-methoxyethyl) ether		43.1					
Bromobenzene	10.62	37.9	44.5	127.4	171.5	199.9	219.2
4-Bromobenzoic acid			87.9				
1-Bromobutane	6.69	32.5	36.7	136.6	180.0	211.2	234.4
(\pm)-2-Bromobutane	6.89	30.8	34.4	138.1	214.7	238.2	
1-Bromo-2-chloroethane		33.7	38.2				
Bromochloromethane		30.0	32.8				
1-Bromo-3-chloropropane		37.6	44.1				
1-Bromo-2-chloro-1,1,2-trifluoroethane		28.3	30.1				
Bromochloro-2,2,2-trifluoroethane		28.1	29.8				
1-Bromododecane		74.8					
Bromoethane	5.86	27.0	28.0	79.2	102.8	119.6	132.2
Bromoethylene	5.12	23.4	18.2	66.6	83.0	94.1	102.3
1-Bromoheptane			50.6			74.8	
1-Bromohexadecane			94.4				
1-Bromohexane			45.9				
Bromomethane, $\Delta H_t = 0.47^{-99.4}$	5.98	23.9	22.8	50.0	62.7	72.2	79.5
1-Bromo-2-methylpropane		31.3	34.8				
2-Bromo-2-methylpropane	1.97	29.2	31.8	146.1	190.7	220.3	241.6
$\Delta H_t = 5.7^{-64.5}$							
$\Delta H_t = 1.0^{-41.6}$							
1-Bromonaphthalene	15.16	39.3	52.5				
1-Bromooctane			55.8				
1-Bromopentane	11.46	35.0	41.3	165.6	219.0	257.5	286.0
1-Bromopropane	6.53	29.8	32.0	107.5	140.8	164.9	182.8
2-Bromopropane		28.3	30.2	110.2	144.0	167.7	185.2
3-Bromopropene		30.2	32.7				
Bromotrichloromethane	2.54						
Bromotrifluoromethane				79.3	91.3	97.5	100.9
Bromotrimethylsilane			32.6				
1,2-Butadiene	7.0	24.0	23.2	98.4	128.5	150.7	167.4
1,3-Butadiene	7.98	22.5	20.9	101.2	154.1	169.5	
1,3-Butadiyne			84.4		96.8	105.1	111.3
Butanal	11.09	31.5	34.5	126.4	165.7	195.0	216.3
Butanamide	17.6		85.9				
Butane, $\Delta H_t = 2.1^{-165.6}$	4.66	22.4	21.0	123.9	168.6	201.8	226.9
1,2-Butanediamine			46.3				
Butanedinitrile	3.7	48.5	70.0				
1,3-Butanediol		58.5	67.8				
1,4-Butanediol			76.6				
2,3-Butanediol			59.2				

TABLE 6.2 Heats of Fusion, Vaporization, and Sublimation and Specific Heat at Various Temperatures of Organic Compounds (*Continued*)

Substance	ΔH_m	ΔH_v	ΔH_s	C_p			
				400 K	600 K	800 K	1000 K
2,3-Butanedione			38.7				
1,4-Butanedithiol			55.1				
Butanenitrile	5.02	33.7	39.3	118.8	155.1	181.9	201.8
<i>meso</i> -1,2,3,4-Butanetetrol			135.1				
1,4-Butanedithiol			49.7				
1-Butanethiol	10.46	32.2	36.6	146.2	194.7	233.0	263.4
2-Butanethiol	6.5	30.6	34.0	148.0	194.2	227.2	251.1
1,2,4-Butanetriol		58.6					
Butanoic acid	11.08	41.8	40.5				
Butanoic anhydride		50.0					
1-Butanol	9.28	43.3	52.3	137.2	183.7	218.0	243.8
2-Butanol		40.8	49.7	141.0	187.1	220.4	245.3
2-Butanone	8.44	31.3	34.8	124.7	163.6	192.8	214.8
<i>trans</i> -2-Butenal			34.5				
1-Butene	3.9	22.1	20.2	109.0	147.1	174.9	195.9
<i>cis</i> -2-Butene	7.58	23.3	22.2	101.8	141.4	171.0	193.1
<i>trans</i> -2-Butene	9.8	22.7	21.4	108.9	145.6	184.9	194.9
<i>cis</i> -2-Butenedinitrile			72.0				
<i>cis</i> -2-Butenedioic acid			110.0				
<i>trans</i> -2-Butenedioic acid			136.3				
<i>cis</i> -2-Butene-1,4-diol		66.1					
<i>trans</i> -2-Butene-1,4-diol		69.0					
<i>cis</i> -2-Butenenitrile			38.9				
<i>trans</i> -2-Butenenitrile			40.0				
3-Butenenitrile			40.0				
<i>cis</i> -2-Butenoic acid	12.57						
<i>trans</i> -2-Butenoic acid	12.98						
<i>cis</i> -2-Buten-1-ol		46.4					
1-Buten-3-yne				89.0	111.6	127.2	138.7
2-Butoxyethanol			56.6				
1- <i>tert</i> -Butoxy-2-ethoxyethane			50.9				
2-(2-Butoxyethoxy)ethanol		28.0					
2-Butoxyethyl acetate			59.5				
1- <i>tert</i> -Butoxy-2-methoxyethane		38.5	47.8				
<i>N</i> -Butylacetamide			76.1				
Butyl acetate		36.3	43.9				
<i>tert</i> -Butyl acetate		33.1	38.0				
Butylamine		31.8	35.7	148.3	197.9	234.4	261.7
<i>sec</i> -Butylamine		29.9	32.8	148.1	199.0	236.1	261.7
<i>tert</i> -Butylamine	0.88	28.3	29.6	152.6	204.5	240.5	266.9
Butylbenzene	11.22	38.9	51.4	229.1	314.6	373.9	416.3
<i>sec</i> -Butylbenzene	9.83	38.0	48.0				
<i>tert</i> -Butylbenzene	8.39	37.6	47.7				
<i>sec</i> -Butyl butanoate			47.3				
Butyl chloroacetate			51.0				
Butyl 2-chlorobutanoate			52.7				
Butyl 3-chlorobutanoate			53.1				
Butyl 4-chlorobutanoate			54.4				
Butyl 2-chloropropanoate			54.4				
Butyl 3-chlorobutanoate			55.4				

TABLE 6.2 Heats of Fusion, Vaporization, and Sublimation and Specific Heat at Various Temperatures of Organic Compounds (*Continued*)

Substance	ΔH_m	ΔH_v	ΔH_s	C_p			
				400 K	600 K	800 K	1000 K
Butyl crotonate			51.9				
<i>sec</i> -Butyl crotonate			49.4				
Butylcyclohexane	14.16	38.5	49.4	276.1	289.5	469.9	525.9
Butylcyclopentane	11.3	36.2	45.9	241.7	336.3	407.3	480.3
<i>N</i> -Butyldiacetamide			64.4				
Butyl dichloroacetate			52.3				
Butylethylamine		34.0	40.2				
Butyl ethyl ether		31.6	36.3				
Butyl ethyl sulfide	12.4	37.0	44.5	202.4	271.8	325.3	367.2
<i>tert</i> -Butyl ethyl sulfide	7.1	33.5	39.3				
Butyl formate		36.6	41.1				
<i>tert</i> -Butyl hydroperoxide			47.7				
Butylisopropylamine		34.5	42.1				
Butyllithium			107.1				
Butyl methyl ether		29.6	32.4				
<i>sec</i> -Butyl methyl ether		28.1	30.2				
<i>tert</i> -Butyl methyl ether		27.9	29.8				
Butyl methyl sulfide	12.5	34.5	40.5	174.6	233.0	278.4	314.1
<i>tert</i> -Butyl methyl sulfide	8.4	31.5	35.8				
Butyl methyl sulfone			76.2				
<i>tert</i> -Butyl methyl sulfone			82.4				
Butyl octadecanoate	56.90						
<i>tert</i> -Butyl peroxide			31.8				
Butyl propyl ether		33.7	40.2				
Butyl thiolacetate			48.1				
Butyl trichloroacetate			53.6				
Butyl vinyl ether		31.6	36.2				
1-Butyne	6.0	24.5	23.3	99.9	129.0	150.4	166.7
2-Butyne	9.23	26.5	26.6	94.6	124.2	147.0	164.4
2-Butynedinitrile			28.8				
4-Butyrolactone	9.57	52.2					
Butyrophenone			60.7				
(+)-Camphor	6.84	59.5					
9 <i>H</i> -Carbazole	26.9		84.5				
Chloroacetic acid	12.28		75.3				
Chloroacetyl chloride			38.9				
2-Chloroaniline	11.88	44.4	56.8				
2-Chlorobenzaldehyde			53.1				
Chlorobenzene	9.61	35.2	41.0	128.1	172.2	200.4	219.6
2-Chlorobenzoic acid	25.73		79.5				
3-Chlorobenzoic acid			82.0				
4-Chlorobenzoic acid			87.9				
Chloro-1,4-benzoquinone			69.0				
1-Chlorobutane		30.4	33.5	135.1	179.0	210.5	234.0
2-Chlorobutane		29.2	31.5	136.1	180.7	212.7	236.8
Chlorocyclohexane			43.5				
1-Chloro-1,1-difluoroethane	2.69	22.4					
Chlorodifluoromethane	4.12	20.2		65.4	78.9	87.2	92.4
2-Chloro-1,4-dihydroxybenzene			69.0				
Chlorodimethylsilane		26.2					

TABLE 6.2 Heats of Fusion, Vaporization, and Sublimation and Specific Heat at Various Temperatures of Organic Compounds (*Continued*)

Substance	ΔH_m	ΔH_v	ΔH_s	C_p			
				400 K	600 K	800 K	1000 K
Chlorodiphenylsilane			69.5				
1-Chloro-2,3-epoxypropane		33.1	40.6				
Chloroethane	4.45	24.7		77.6	101.6	118.8	131.7
2-Chloroethanol		41.4					
1-Chloro-2-ethylbenzene			47.3				
1-Chloro-4-ethylbenzene			48.1				
Chloroethylene	4.75	20.8		65.0	82.1	93.5	101.9
2-Chloroethyl vinyl ether		38.2					
Chloroethyne				60.2	66.8	71.0	74.3
1-Chloroheptane			47.7				
1-Chlorohexane		35.7	42.8				
Chlorohydroquinone			69.0				
Chloromethane	6.43	21.4	18.9	48.2	61.3	71.3	78.9
1-Chloro-2-methylbenzene	8.37	37.5					
1-Chloro-3-methylbenzene	10.46						
1-Chloro-4-methylbenzene		38.7					
1-Chloro-3-methylbutane		32.0	36.2				
1-Chloro-2-methylpropane		29.2	31.7	136.1	180.7	212.7	236.8
2-Chloro-2-methylpropane	2.09	27.6	29.0	142.3	184.9	215.5	238.5
$\Delta H_f = 1.7^{-90.1}$							
$\Delta H_f = 5.8^{-53.6}$							
1-Chloronaphthalene	12.90	52.1	65.3				
2-Chloronaphthalene			82.0				
1-Chloro-3-nitrobenzene	19.37						
1-Chloro-4-nitrobenzene	20.77						
1-Chlorooctane			52.4				
Chloropentafluoroacetone			25.3				
Chloropentafluorobenzene		34.8	41.1				
Chloropentafluoroethane	1.88	19.4					
1-Chloropentane		33.2	38.2	164.2	218.0	256.8	285.6
2-Chloropentane		31.8	36.0				
2-Chlorophenol	12.52						
3-Chlorophenol	14.91		53.1				
4-Chlorophenol	14.07		51.9				
1-Chloropropane	5.54	27.2	28.4	106.1	139.9	164.2	182.4
2-Chloropropane	7.39	26.3	26.9	108.7	143.1	167.1	184.8
3-Chloro-1-propene		29.0	28.2	92.6	111.0	137.8	151.9
Chlorotrifluoroethylene	5.6	20.8					
Chlorotrifluoromethane		15.8		77.5	90.3	96.9	100.5
Chlorotrimethylsilane		27.6	30.1				
Chlorotrinitromethane			45.4				
Chrysene	26.15		124.5				
Coronene	19.2						
1,2-Cresol	13.94	45.2	76.0	166.3	220.8	257.5	287.9
1,3-Cresol	9.41	47.4	61.7	162.1	218.7	256.4	286.6
1,4-Cresol	11.89	47.5	73.9	161.7	218.0	255.7	286.5
Cubane			80.3				
Cyanamide	8.76	68.6					
Cyanogen	8.1	23.3	19.7	61.9(g)	68.2	72.9	76.4
Cyclobutane, $\Delta H_f = 5.8^{-126.8}$	1.1	24.2	23.5	100.0	145.4	177.5	200.7

TABLE 6.2 Heats of Fusion, Vaporization, and Sublimation and Specific Heat at Various Temperatures of Organic Compounds (*Continued*)

Substance	ΔH_m	ΔH_v	ΔH_s	C_p			
				400 K	600 K	800 K	1000 K
Cyclobutanecarbonitrile		36.9	44.3				
Cyclobutanenitrile			40.0				
Cyclobutene				90.3	126.8	151.7	169.6
Cyclobutylamine			35.6				
Cyclododecane			76.4				
Cycloheptane	1.88	33.2	38.5	175.0	261.2	322.3	365.7
$\Delta H_t = 5.0^{-138.4}$							
$\Delta H_t = 0.3^{-75.0}$							
$\Delta H_t = 0.5^{-60.8}$							
Cycloheptanone			51.9				
1,3,5-Cycloheptatriene	1.2	38.7		155.4	209.5	245.1	270.2
$\Delta H_t = 2.4^{-119.2}$							
Cyclohexane	2.63	30.0	33.0	149.9	225.2	279.3	317.2
$\Delta H_t = 6.7^{-87}$							
Cyclohexanecarbonitrile			51.9				
Cyclohexanethiol		37.1	44.6				
Cyclohexanol	1.76	45.5	62.0	172.1	248.1	302.0	339.5
$\Delta H_t = 8.2^{-9.7}$							
Cyclohexanone		40.3	45.1	150.6	221.3	272.0	305.4
Cyclohexene	3.29	30.5	33.5	144.9	206.9	248.9	278.7
$\Delta H_t = 4.3^{-134.4}$							
1-Cyclohexenecarbonitrile			53.5				
Cyclohexylamine		36.1	43.7				
Cyclohexylbenzene	15.30		59.9				
Cyclohexylcyclohexane		51.9	58.0				
<i>cis, cis</i> -1,5-Cyclooctadiene			43.4				
Cyclooctane	2.41	35.9	43.3	200.1	297.1	365.3	414.3
$\Delta H_t = 6.3^{-106.7}$							
$\Delta H_t = 0.5^{-89.4}$							
Cyclooctanone			54.4				
1,3,5,7-Cyclooctatetraene	11.3	36.4	43.1	160.9	220.8	260.4	288.2
Cyclooctene			47.0				
Cyclopentadiene			28.4				
Cyclopentane	0.61	27.3	28.5	118.7	178.1	220.1	250.4
$\Delta H_t = 4.8^{-150.8}$							
$\Delta H_t = 0.3^{-135.1}$							
Cyclopentanecarbonitrile			43.4				
1-Cyclopentenecarbonitrile			45.0				
Cyclopentanethiol	7.8	35.3	41.4	144.5	203.6	245.2	275.5
Cyclopentanol			57.6				
Cyclopentanone		36.4	42.7				
Cyclopentene	3.36		28.1	104.9	155.6	191.5	217.3
$\Delta H_t = 0.5^{-186.1}$							
Cyclopentylamine	8.31		40.2				
Cyclopropane	5.44	20.1	16.9	76.6	109.4	140.5	148.1
Cyclopropanecarbonitrile		35.6	41.9				
Cyclopropylamine	13.18		31.3				
Cyclopropylbenzene			50.2				
Cyclopropyl methyl ketone		34.1	38.4				
Decafluorobutane		22.9					

TABLE 6.2 Heats of Fusion, Vaporization, and Sublimation and Specific Heat at Various Temperatures of Organic Compounds (*Continued*)

Substance	ΔH_m	ΔH_v	ΔH_s	C_p			
				400 K	600 K	800 K	1000 K
<i>cis</i> -Decahydronaphthalene $\Delta H_f = 2.1^{-57.1}$	9.49	41.0	50.2	237.0	352.0	432.5	489.5
<i>trans</i> -Decahydronaphthalene	14.41	40.2	43.5	237.6	352.3	432.6	489.2
Decanal				300.4	400.4	472.8	525.9
Decane	28.78	38.8	51.4	298.1	403.2	480.8	536.4
Decanedioic acid	40.8		160.7				
Decanenitrile			66.8				
1-Decanethiol	31.0	46.4	65.5	320.6	429.4	510.9	573.1
Decanoic acid	28.02		118.8				
1-Decanol	37.7	49.8	81.5	187.2	418.2	495.9	553.3
1-Decene	21.10	38.7	50.4	283.6	381.9	453.0	505.9
$\Delta H_f = 8.0^{-74.8}$							
1-Decyne				274.6	363.8	428.5	476.6
Deoxybenzoin			93.3				
Dibenz[<i>de,kl</i>]anthracene			125.5				
Dibenzoyl peroxide	31.4		102.5				
Dibenzyl ether		20.2					
Dibenzyl sulfide			93.3				
Dibenzyl sulfone			125.5				
1,2-Dibromobutane			50.3	153.9	195.4	224.3	244.8
1,4-Dibromobutane			53.1				
2,3-Dibromobutane			37.7				
1,2-Dibromo-1-chloro-1,1,2-trifluoroethane		31.2	35.0				
1,2-Dibromocycloheptane			52.0				
1,2-Dibromocyclohexane			50.5				
1,2-Dibromocyclooctane			54.6				
1,2-Dibromoethane	10.84	34.8	41.7	99.7	122.3	137.8	149.8
1,2-Dibromoheptane			54.4				
Dibromomethane		32.9	37.0	63.0	74.8	82.5	88.0
1,2-Dibromopropane	8.94	35.6	41.7	124.4	157.4	179.5	195.6
1,3-Dibromopropane	13.6		47.5				
1,2-Dibromotetrafluoroethane	7.04	27.0	28.4				
1,2-Dibutoxyethane		47.8	58.8				
Dibutoxymethane			48.1				
Dibutylamine		38.4	49.5				
<i>N,N</i> -Dibutyl-1-butanamine		46.9					
Dibutyl decanedioate		92.9					
Dibutyl disulfide		46.9	64.5	286.1	376.5	442.8	493.1
Di- <i>tert</i> -butyl disulfide			54.3				
Dibutyl ether		36.5	45.0	254.3	340.1	403.8	451.3
Di- <i>sec</i> -butyl ether		34.1	40.8				
Di- <i>tert</i> -butyl ether		32.2	37.6				
Dibutylmercury			63.5				
Di- <i>tert</i> -butyl peroxide			31.8				
Dibutyl 1,2-phthalate		79.2	91.6				
Dibutyl sulfate			75.9				
Dibutyl sulfide	19.4	41.3	53.0	259.8	348.6	420.8	475.8
Di- <i>tert</i> -butyl sulfide		33.3	43.8				
Dibutyl sulfite			67.8				
Dibutyl sulfone			100.4				

TABLE 6.2 Heats of Fusion, Vaporization, and Sublimation and Specific Heat at Various Temperatures of Organic Compounds (*Continued*)

Substance	ΔH_m	ΔH_v	ΔH_s	C_p			
				400 K	600 K	800 K	1000 K
Dichloroacetyl chloride			39.3				
1,2-Dichlorobenzene	12.93	39.7	50.2	142.8	184.4	210.4	227.7
1,3-Dichlorobenzene	12.64	38.6	48.6	143.0	184.5	210.4	227.7
1,4-Dichlorobenzene	17.15	38.8	49.0	143.3	184.8	210.7	227.9
2,6-Dichlorobenzoquinone			69.9				
2,2'-Dichlorobiphenyl			96.2				
4,4'-Dichlorobiphenyl			103.8				
1,2-Dichlorobutane		33.9	39.6				
1,4-Dichlorobutane			46.4				
Dichlorodifluoromethane	4.14	20.1		82.4	93.6	99.1	100.0
Dichlorodimethylsilane			34.3				
Dichlorodiphenylsilane			69.5				
1,1-Dichloroethane	8.84	28.9	30.6	91.4	113.7	128.8	139.8
1,2-Dichloroethane	8.83	32.0	35.2	92.1	112.6	127.2	138.1
1,1-Dichloroethylene	6.51	26.1	26.5	78.7	93.9	103.4	110.0
<i>cis</i> -1,2-Dichloroethylene	7.20	30.2	31.0	77.0	93.0	102.9	109.8
<i>trans</i> -1,2-Dichloroethylene	11.98	28.9	29.3	77.7	93.2	102.9	109.8
2,2-Dichloroethyl ether		38.4					
Dichlorofluoromethane		25.2		70.2	82.4	89.6	94.2
1,2-Dichlorohexafluoropropane		26.3	26.9				
1,2-Dichlorohexane			48.2				
Dichloromethane	6.00	28.1	28.8	59.6	72.4	80.8	86.8
1,2-Dichloro-4-methylbenzene	10.68						
1,2-Dichloropentane		36.5	43.9				
1,5-Dichloropentane			50.7				
(\pm)-1,2-Dichloropropane	6.40	31.8	36.0	119.7	152.6	175.6	192.8
1,3-Dichloropropane		35.2	40.8	120.0	151.5	173.9	190.4
2,2-Dichloropropane		29.3	32.6	127.9	159.2	179.9	194.8
1,3-Dichloro-2-propanol			66.9				
1,2-Dichlorotetrafluoroethane	6.32	23.3					
Dicyanoacetylene			28.8				
Dicyclopentadienyliron			73.6				
Dicyclopropyl ketone			53.7				
Diethanolamine	25.10	65.2					
1,1-Diethoxyethane		36.3	43.2				
1,2-Diethoxyethane		36.3	43.2				
Diethoxymethane		31.3	35.7				
1,3-Diethoxypropane		37.2	45.9				
2,2-Diethoxypropane			31.8				
Diethylamine		29.1	31.3	143.9	197.2	235.0	263.2
1,2-Diethylbenzene	16.8	39.4	52.8	234.4	316.6	374.6	416.3
1,3-Diethylbenzene	11.0	39.4	52.5	230.2	314.6	379.7	415.8
1,4-Diethylbenzene	10.6	39.4	52.5	228.8	313.1	372.5	414.9
Diethyl carbonate		36.2	43.6				
Diethyl disulfide	9.4	37.6	45.2	171.1	218.6	251.8	276.0
Diethylene glycol diethyl ether	13.60	49.0	58.4				
Diethylene glycol dimethyl ether		36.2	44.7				
Diethylene glycol monoethyl ether		47.5					
Diethylene glycol monomethyl ether		46.6					
Diethyl ether	7.27	26.5	27.1	138.1	183.8	218.7	244.8

TABLE 6.2 Heats of Fusion, Vaporization, and Sublimation and Specific Heat at Various Temperatures of Organic Compounds (*Continued*)

Substance	ΔH_m	ΔH_v	ΔH_s	C_p			
				400 K	600 K	800 K	1000 K
Diethyl malonate		54.8					
Diethyl oxalate		42.0	63.5				
Diethyl peroxide			30.5				
3,3-Diethylpentane	10.09	34.6	42.0				
Diethyl 1,2-phthalate			88.3				
Diethyl sulfide	11.90	31.8	35.8	145.0	192.9	229.7	258.5
Diethyl sulfite			48.5				
Diethyl sulfone			86.2				
Diethyl sulfoxide			62.3				
Diethylzinc			40.2				
1,2-Difluorobenzene	11.1	32.2	36.2	137.1	181.3	209.7	229.0
1,3-Difluorobenzene	8.58	31.1	34.6	137.0	180.5	207.8	225.6
1,4-Difluorobenzene		31.8	35.5	137.4	180.1	207.8	225.7
2,2'-Difluorobiphenyl			95.0				
4,4'-Difluorobiphenyl			91.2				
1,1-Difluoroethane		21.6	19.1	83.4	107.5	124.3	136.3
1,1-Difluoroethylene				71.8	89.2	100.2	107.7
Difluoromethane				51.1	65.8	76.2	83.7
9,10-Dihydroanthracene			93.3				
Dihydro-2 <i>H</i> -pyran			32.2				
5,12-Dihydrotetracene			115.9				
2,3-Dihydrothiophene		33.2	37.7				
2,5-Dihydrothiophene		34.8	40.0				
2,4-Dihydrothiophene-1,1-dioxide			62.8				
1,4-Dihydroxybenzene	27.11		99.2				
1,2-Diiodobenzene			64.9				
1,2-Diiodoethane			65.7	96.0	116.8	131.3	141.6
Diiodomethane	44.80	42.5	51.0	65.9	76.9	83.9	89.1
Diisobutylamine			39.3				
Diisobutyl ether		34.0	40.9				
Diisobutyl sulfide			48.7				
Diisopropylamine		30.4	34.6				
Diisopropyl ether	11.03	29.1	32.1	196.2	262.0	311.3	348.0
Diisopropylmercury			53.6				
Diisopropyl sulfide	10.4	33.8	39.6	211.9	277.1	322.7	356.6
Diketene		36.8	42.9				
1,2-Dimethoxybenzene	16.04	48.2	66.9				
1,1-Dimethoxyethane			30.5				
1,2-Dimethoxyethane	12.60	32.4	36.4				
Dimethoxymethane	8.33		35.1				
2,2-Dimethoxypropane			29.4				
<i>N,N</i> -Dimethylacetamide	10.42	43.4	50.2				
Dimethylamine	5.94	26.4	25.0	87.4	118.9	142.0	159.8
Dimethylaminomethanol			50.2				
<i>N,N</i> -Dimethylaminotrimethylsilane			31.8				
<i>N,N</i> -Dimethylaniline			52.8				
1,4-Dimethylbicyclo[2.2.1]heptane		33.3	38.9				
2,3-Dimethylbicyclo[2.2.1]-2-heptene		34.9	42.2				
2,2-Dimethylbutane	0.58	26.3	27.7	182.8	251.0	298.7	333.5

TABLE 6.2 Heats of Fusion, Vaporization, and Sublimation and Specific Heat at Various Temperatures of Organic Compounds (*Continued*)

Substance	ΔH_m	ΔH_v	ΔH_s	C_p			
				400 K	600 K	800 K	1000 K
$\Delta H_t = 5.4^{-147.3}$							
$\Delta H_t = 0.3^{-132.3}$							
2,3-Dimethylbutane	0.80	27.4	29.1	181.2	247.7	314.6	331.0
$\Delta H_t = 6.5^{-137.1}$							
2,2-Dimethyl-1-butanol		42.6	56.1				
2,3-Dimethyl-1-butanol		47.3					
3,3-Dimethyl-1-butanol		46.4					
2,3-Dimethyl-2-butanol		40.4	51.0				
(\pm)-3,3-Dimethyl-2-butanol		43.9					
3,3-Dimethyl-2-butanone		33.4	37.9				
2,3-Dimethyl-1-butene		27.4	29.2	178.2	231.8	272.0	302.1
3,3-Dimethyl-1-butene	1.1	25.7	27.1	162.8	223.4	266.1	297.1
$\Delta H_t = 4.3^{-148.3}$							
2,3-Dimethyl-2-butene	5.46	29.6	32.5	156.8	216.7	262.7	297.7
$\Delta H_t = 3.5^{-76.3}$							
Di(3-methylbutyl) ether		35.2					
Dimethylcadmium			38.0				
1,1-Dimethylcyclohexane	2.06	32.5	37.9	212.1	310.0	379.5	427.6
$\Delta H_t = 6.0^{-120.0}$							
cis-1,2-Dimethylcyclohexane	1.64	33.5	39.7	213.8	309.6	377.0	424.3
$\Delta H_t = 8.3^{-100.6}$							
trans-1,2-Dimethylcyclohexane	10.49	33.0	38.4	217.2	312.1	378.7	425.5
cis-1,3-Dimethylcyclohexane	10.82	32.9	38.3	214.2	310.5	378.7	426.8
trans-1,3-Dimethylcyclohexane	9.86	33.4	39.2	213.8	308.8	375.7	423.0
cis-1,4-Dimethylcyclohexane	9.31	33.3	39.0	213.8	308.8	375.7	423.0
trans-1,4-Dimethylcyclohexane	12.33	32.6	37.9	215.9	312.1	378.9	425.7
1,1-Dimethylcyclopentane	1.1	30.3	33.8	182.2	262.6	318.7	359.1
$\Delta H_t = 6.5^{-126.4}$							
cis-1,2-Dimethylcyclopentane	1.7	31.7	35.7	182.7	262.4	317.9	358.0
$\Delta H_t = 6.7^{-131.7}$							
trans-1,2-Dimethylcyclopentane	7.2	30.9	34.6	182.9	262.2	317.3	357.4
cis-1,3-Dimethylcyclopentane	7.4	30.4	34.2	182.9	262.2	317.3	357.4
trans-1,3-Dimethylcyclopentane	7.3	30.8	34.5	182.9	262.2	317.3	357.4
cis-2,4-Dimethyl-1,3-dioxane			39.9				
4,5-Dimethyl-1,3-dioxane			42.5				
5,5-Dimethyl-1,3-dioxane			41.3				
Dimethyl disulfide	9.19	33.8	37.9	110.3	137.4	157.6	172.8
Dimethyl ether	4.94	21.5	18.5	79.6	105.3	125.7	141.4
N,N-Dimethylformamide	16.15	38.4	46.9				
Dimethylglyoxime			97.1				
2,2-Dimethylheptane	8.90						
2,6-Dimethyl-4-heptanone		39.9	50.9				
2,2-Dimethylhexane	6.78	32.1	37.3				
2,3-Dimethylhexane		33.2	38.8				
2,4-Dimethylhexane		32.5	37.8				
2,5-Dimethylhexane	12.95	32.5	37.9				
3,3-Dimethylhexane	6.98	32.3	37.5				
3,4-Dimethylhexane		33.2	39.0				
cis-2,2-Dimethyl-3-hexene			37.2				

TABLE 6.2 Heats of Fusion, Vaporization, and Sublimation and Specific Heat at Various Temperatures of Organic Compounds (*Continued*)

Substance	ΔH_m	ΔH_v	ΔH_s	C_p			
				400 K	600 K	800 K	1000 K
<i>trans</i> -2,2-Dimethyl-3-hexene			37.3				
1,1-Dimethylhydrazine	10.1	32.6	35.0				
1,2-Dimethylhydrazine		35.2	39.3				
3,5-Dimethylisoxazole			45.2				
Dimethyl maleate	14.7		44.3				
Dimethylmercury			34.6				
6,6-Dimethyl-2-methylene-bicyclo[3.1.1]heptane		40.2	46.4				
2,4-Dimethyloctane		36.5	47.1				
Dimethyl oxalate	21.07		47.4				
3,3-Dimethyloxetane		30.9	33.9				
2,2-Dimethylpentane	5.86	29.2	32.4	211.0	285.9	340.7	381.6
2,3-Dimethylpentane		30.5	34.3	211.0	285.9	340.7	381.6
2,4-Dimethylpentane	6.69	29.6	32.9	211.0	285.9	340.7	381.6
3,3-Dimethylpentane	7.07	29.6	33.0	211.0	285.9	340.7	381.6
2,2-Dimethyl-3-pentanone		36.1	42.3				
2,4-Dimethyl-3-pentanone	11.18	34.6	41.5				
2,4-Dimethyl-1-pentene			33.2				
4,4-Dimethyl-1-pentene			29.0				
2,4-Dimethyl-2-pentene			34.4				
<i>cis</i> -4,4-Dimethyl-2-pentene			32.7				
<i>trans</i> -4,4-Dimethyl-2-pentene			32.7				
2,7-Dimethylphenanthrene			106.7				
4,5-Dimethylphenanthrene			104.6				
9,10-Dimethylphenanthrene			119.5				
2,3-Dimethylphenol	21.02		84.0				
2,4-Dimethylphenol		47.1	65.0				
2,5-Dimethylphenol	23.38	46.9	85.0				
2,6-Dimethylphenol	18.90	44.5	75.3				
3,4-Dimethylphenol	18.13	49.7	85.0				
3,5-Dimethylphenol	18.00	49.3	82.0				
Dimethyl 1,2-phthalate	162.7						
2,2-Dimethylpropane $\Delta H_f = 2.6^{-133.1}$	3.10	22.7	21.8	157.1	218.5	254.3	283.7
2,2-Dimethylpropanenitrile		32.4	37.3				
2,2-Dimethyl-1-propanol		9.6					
2,3-Dimethylpyridine		39.1	47.7				
2,4-Dimethylpyridine		38.5	47.5				
2,5-Dimethylpyridine			47.8				
2,6-Dimethylpyridine	10.04	37.5	45.4				
3,4-Dimethylpyridine		40.0	50.5				
3,5-Dimethylpyridine		39.5	49.5				
Dimethyl sulfate			48.5				
Dimethyl sulfide	7.99	27.0	27.7	88.4	113.0	132.2	147.2
Dimethyl sulfite			40.2				
Dimethyl sulfone			77.0				
Dimethyl sulfoxide	14.37	43.1	52.9				
2,2-Dimethylthiacyclopropane			35.8				
Dimethylzinc			29.5				
Dinitromethane			46.0				

TABLE 6.2 Heats of Fusion, Vaporization, and Sublimation and Specific Heat at Various Temperatures of Organic Compounds (*Continued*)

Substance	ΔH_m	ΔH_v	ΔH_s	C_p			
				400 K	600 K	800 K	1000 K
2,4-Dinitrophenol			104.6				
2,6-Dinitrophenol			112.1				
1,1-Dinitropropane			62.5				
1,3-Dioxane		34.4	39.1				
1,4-Dioxane	12.85	34.2	38.6	126.5	181.8	218.2	243.3
$\Delta H_t = 2.4^{-0.3}$							
1,3-Dioxolane	27.48		35.6				
Diphenylamine	17.86		89.1				
Diphenyl carbonate	23.4		90.0				
Diphenyl disulfide			95.0				
Diphenyl disulfone			161.9				
Diphenylenimine			84.5				
1,2-Diphenylethane		51.5	91.4				
1,1-Diphenylethylene			73.2				
Diphenyl ether	17.22	48.2	67.0				
6,6-Diphenylfulvene			104.6				
Diphenylmercury			112.8				
Diphenylmethane	18.2		67.5				
1,3-Diphenyl-2-propanone			89.1				
Diphenyl sulfide			67.8				
Diphenyl sulfone			106.3				
Diphenyl sulfoxide			97.1				
1,2-Dipropoxyethane			50.6				
Dipropylamine		33.5	40.0				
Dipropyl disulfide	13.8	41.9	54.1	186.2	298.3	350.2	390.0
Dipropyl ether	8.83	31.3	35.7	196.2	262.0	311.3	348.0
Dipropylmercury			55.2				
Dipropyl sulfate			66.9				
Dipropyl sulfide	12.1	36.6	44.2	201.7	272.5	328.2	372.6
Dipropyl sulfite			58.6				
Dipropyl sulfone			79.9				
Dipropyl sulfoxide			74.5				
Divinyl ether			26.2				
Divinyl sulfone			56.5				
Dodecane	36.55	44.5	61.5	356.2	481.3	572.2	656.5
Dodecanedioic acid			153.1				
Dodecanenitrile			76.1				
Dodecanoic acid	36.64		132.6				
Dodecanol	31.4	63.5	92.0				
1-Dodecene	17.42	44.0	60.8	341.8	460.0	545.6	608.8
$\Delta H_t = 4.6^{-60.2}$							
1,2-Epoxybutane		30.3					
1,2-Epoxypropane		21.6					
Ergosterol			118.4				
Ethane	2.86	14.7	5.2	65.5	89.3	108.0	122.6
Ethane- d_6				81.7	108.5	127.4	140.5
1,2-Ethanediamine	22.58	38.0	45.0				
1,2-Ethanediol	11.23	50.5	67.8	113.2	136.9	166.9	
1,2-Ethanediol diacetate		45.5	61.4				
1,2-Ethanedithiol		37.9	44.7				

TABLE 6.2 Heats of Fusion, Vaporization, and Sublimation and Specific Heat at Various Temperatures of Organic Compounds (*Continued*)

Substance	ΔH_m	ΔH_v	ΔH_s	C_p			
				400 K	600 K	800 K	1000 K
Ethanethiol	4.98	26.8	27.3	88.2	113.9	133.2	148.0
Ethanol	5.02	38.6	42.3	81.2	107.7	127.2	141.9
Ethanolamine	20.50	49.8					
Ethoxybenzene		40.7	51.0				
2-Ethoxyethanol		39.2	48.2				
2-(2-Ethoxyethoxy)ethanol		47.5					
2-(2-Ethoxyethoxy)ethyl acetate		91.2					
2-Ethoxyethyl acetate			52.7				
1-Ethoxy-2-methoxyethane		34.3	39.8				
N-Ethylacetamide			64.9				
Ethyl acetate	10.48	31.9	35.6	137.4	182.6	213.4	234.5
Ethyl acrylate		34.7					
Ethylamine		28.0	26.6	90.6	119.6	141.8	158.5
N-Ethylaniline			52.3				
Ethylbenzene	9.18	35.6	42.2	170.5	236.1	281.0	312.8
2-Ethylbenzoic acid			100.7				
3-Ethylbenzoic acid			99.1				
4-Ethylbenzoic acid			97.5				
2-Ethyl-1-butanol		43.2	63.2				
Ethyl butanoate		35.5	42.7				
2-Ethylbutanoic acid		51.2					
2-Ethyl-1-butene		28.8	31.1	170.3	228.0	269.5	300.8
Ethyl <i>trans</i> -2-butenolate			44.4				
Ethyl chloroacetate		40.4	49.5				
Ethyl 4-chlorobutanoate			52.7				
Ethyl chloroformate			42.3				
Ethyl <i>trans</i> -cinnamate		58.6					
Ethyl crotonate			44.3				
Ethyl cyanoacetate		64.4					
Ethylcyclobutane		28.7	31.2				
Ethylcyclohexane	8.33	34.0	40.6	215.9	310.0	377.0	423.8
1-Ethylcyclohexene			43.3				
Ethylcyclopentane	6.9	32.0	36.4	183.6	258.2	314.7	356.3
1-Ethylcyclopentene		38.5					
Ethyl dichloroacetate			50.6				
Ethyl 2,2-dimethylpropanoate		34.5	41.2				
Ethylene	3.35	13.5		53.1	70.7	83.8	93.9
Ethylene- <i>d</i> ₄				63.9	82.3	95.6	104.9
Ethylene carbonate	13.19	50.1	73.2				
2,2'-(Ethylenedioxy)bis(ethanol)		71.4	79.1				
Ethylene glycol (<i>see</i> 1,2-Ethanediol)							
Ethylene glycol diacetate			61.4				
Ethylene oxide	5.2	25.5	24.8	62.6	86.3	102.9	114.9
Ethylenimine		30.3	34.6	70.4	98.6	117.7	131.6
N-Ethylformamide			58.4				
Ethyl formate	9.20	29.9	32.0				
2-Ethylhexanal			49.0				
2-Ethylhexane		33.6	39.6				
Ethyl hexanoate			51.7				
2-Ethylhexanoic acid		56.0	75.6				

TABLE 6.2 Heats of Fusion, Vaporization, and Sublimation and Specific Heat at Various Temperatures of Organic Compounds (*Continued*)

Substance	ΔH_m	ΔH_v	ΔH_s	C_p			
				400 K	600 K	800 K	1000 K
2-Ethyl-1-hexanol		45.2					
2-Ethylhexyl acetate		43.5	48.1				
2-Ethyl hydroperoxide			43.1				
Ethylidenecyclohexane			42.0				
Ethylidenecyclopentane		18.1					
Ethyl isocyanide			33.5				
Ethyl isopentanoate	8.7	43.9					
Ethyl isopentyl ether		33.0	39.0				
Ethylisopropylamine		29.9	33.1				
Ethyl isopropyl ether		28.2	30.1				
Ethyl isopropyl sulfide	8.7	32.7	37.8				
Ethyl lactate		46.4	49.4				
Ethyllithium			116.7				
Ethylmercury bromide			76.6				
Ethylmercury chloride			76.1				
Ethylmercury iodide			79.5				
1-Ethyl-2-methylbenzene	10.0	38.9	47.7	202.9	275.3	326.8	363.6
1-Ethyl-3-methylbenzene	7.6	38.5	46.9	198.7	273.6	325.5	363.2
1-Ethyl-4-methylbenzene	13.4	38.4	46.6	197.5	272.0	324.7	362.2
Ethyl 2-methylbutanoate			44.4				
Ethyl 3-methylbutanoate		37.0	43.9				
2-Ethyl-3-methyl-1-butene			34.5				
1-Ethyl-1-methylcyclopentane		33.2	38.9				
Ethyl methyl ether		26.7		109.1	144.7	172.3	193.2
3-Ethyl-2-methylpentane	11.34	32.9	38.5				
3-Ethyl-3-methylpentane	10.84	32.8	38.0				
3-Ethyl-2-methyl-1-pentene			37.5				
Ethyl 2-methylpropanoate		33.7	39.8				
Ethyl methyl sulfide	9.8	29.5	31.9	116.4	152.3	179.6	200.6
Ethyl nitrate	8.5	33.1	36.3	120.2	155.1	178.7	195.4
1-Ethyl-2-nitrobenzene			59.8				
1-Ethyl-4-nitrobenzene			62.8				
3-Ethylpentane	9.55	31.1	35.2	211.0	285.9	340.7	381.6
Ethyl pentanoate		37.0	47.0				
Ethyl pentyl ether		34.4	41.0				
2-Ethylphenol			63.6				
3-Ethylphenol			68.2				
4-Ethylphenol			80.3				
Ethylphosphonic acid			50.6				
Ethylphosphonic dichloride			42.7				
Ethyl propanoate		33.9	39.2				
Ethyl propyl ether		28.9	31.4				
Ethyl propyl sulfide	10.6	34.2	40.0	173.3	232.7	279.0	315.6
Ethyl trichloroacetate			51.0				
S-Ethyl thiolacetate	34.4	40.0					
Ethyl 2-vinylacrylate			48.5				
Ethyl vinyl ether		26.2	26.6				
Fluoranthrene	18.87		99.2				
9H-Fluorene	19.58						
Fluorobenzene	11.31	31.2	34.6	125.5	171.0	200.1	220.0

TABLE 6.2 Heats of Fusion, Vaporization, and Sublimation and Specific Heat at Various Temperatures of Organic Compounds (*Continued*)

Substance	ΔH_m	ΔH_v	ΔH_s	C_p			
				400 K	600 K	800 K	1000 K
4-Fluorobenzoic acid			91.2				
Fluoroethane				74.1	98.6	116.4	129.7
Fluoromethane		16.7		44.2	57.9	68.8	77.2
1-Fluorooctane		40.4	49.7				
1-Fluoropropane				102.7	137.3	162.7	181.5
2-Fluoropropane				103.5	138.7	163.8	182.2
2-Fluorotoluene		35.4					
4-Fluorotoluene	9.4	34.1	39.4	152.4	207.9	245.2	271.3
Fluorotrichloromethane		25.0					
Fluorotrinitromethane			34.7				
Formaldehyde		23.3		39.2(g)	48.2	55.9	62.0
Formamide	6.69		60.2				
Formic acid	12.7	22.7	20.1	53.8	67.0	76.8	83.5
Formyl fluoride		21.7		46.4	56.2	63.1	67.9
Fumaric acid			136.0				
Fumaronitrile			72.0				
Furan, $\Delta H_t = 2.1-123.2$	3.80	27.1	27.5	88.7	122.6	164.9	158.5
2-Furancarboxaldehyde	14.35	43.2	50.6				
2-Furancarboxylic acid			108.5				
Furanmethanol	13.13	53.6	64.4				
Glutaric acid	20.9						
Glycerol	18.28	61.0	85.8				
Glyceryl triacetate			85.7				
Glyceryl tributanoate			107.1				
Glyceryl trinitrate	21.87		100.0				
Heptadecane, $\Delta H_t = 11.0^{11.1}$	40.5	52.9	86.0	501.4	676.8	803.7	897.9
Heptadecanoic acid	58.8						
1-Heptadecene	31.4	51.8	85.0	486.9	655.5	777.1	866.9
1-Heptanal	23.6		47.7	213.4	283.3	333.9	371.1
Heptane	14.16	31.8	36.6	211.0	285.9	340.7	381.6
1-Heptanenitrile			51.9				
1-Heptanethiol	25.4	39.8	50.6	233.5	312.1	372.0	418.4
Heptanoic acid			74.0				
1-Heptanol	13.2	48.1	66.8	224.4	300.9	357.0	392.5
2-Heptanol		49.8					
3-Heptanol		42.5					
2-Heptanone		38.3	47.2				
4-Heptanone		36.2					
1-Heptene, $\Delta H_t = 0.3-136$	12.66	31.1	35.5	196.5	264.6	314.1	351.0
trans-2-Heptene	11.72						
Heptylamine			50.0				
Heptyl methyl ether			46.9				
Hexachlorobenzene	23.85		92.6	201.2	233.4	250.9	260.8
Hexachloroethane, $\Delta H_t = 8.0^{71.3}$	9.8	45.9	59.0	151.5	166.6	173.6	177.3
Hexadecafluoroethylcyclohexane			38.5				
Hexadecafluoroheptane			36.4				
Hexadecane	51.8	51.2	81.4	472.3	687.7	757.4	846.0
Hexadecanoic acid	42.04		154.4				
1-Hexadecanol, $\Delta H_t = 16.6^{34}$	34.29		169.5	485.7	652.7	773.6	863.2
1-Hexadecene	30.2	50.4	80.3	457.9	616.4	731.82	815.0

TABLE 6.2 Heats of Fusion, Vaporization, and Sublimation and Specific Heat at Various Temperatures of Organic Compounds (*Continued*)

Substance	ΔH_m	ΔH_v	ΔH_s	C_p			
				400 K	600 K	800 K	1000 K
Hexadienoic acid	13.6						
Hexafluoroacetone		19.8	21.3				
Hexafluoroacetylacetone		27.1	30.6				
Hexafluorobenzene	11.58	31.7	35.7	183.6	219.9	241.1	253.7
Hexafluoroethane, $\Delta H_t = 3.7-169.2$	2.7	16.2		125.6	149.0	160.7	166.8
<i>cis</i> -Hexahydroindane			57.5				
<i>trans</i> -Hexahydroindane			56.1				
Hexamethylbenzene	20.6	48.2	74.7	310.4	406.4	474.9	525.3
$\Delta H_t = 1.1-156.7$							
$\Delta H_t = 1.8^{110.7}$							
1,1,1,3,3,3-Hexamethyldisilazane			41.4				
Hexamethyldisiloxane			37.2				
Hexamethylphosphoric triamide	14.28						
Hexanal				184.2	243.9	287.4	319.7
Hexanamide	25.1		98.7				
Hexane	13.08	28.9	31.6	181.9	246.8	294.4	330.1
1,6-Hexanedioic acid	34.85		129.3				
1,6-Hexanediol	25.5		83.3				
Hexanenitrile		38.0	47.9				
1-Hexanethiol	18.0(1)	37.2	45.8	204.5	273.1	325.1	366.7
Hexanoic acid	15.40	71.1	72.2				
1-Hexanol	15.40	44.5	61.6	195.3	261.8	310.7	346.9
2-Hexanol		41.0	58.5				
3-Hexanol	44.3	46.0					
2-Hexanone	14.90	36.4	43.1				
3-Hexanone	13.49	35.4	42.5				
1-Hexene	9.35	28.3	30.6	167.5	225.5	267.9	299.3
<i>cis</i> -2-Hexene	8.86	29.1	32.2	161.5	221.8	165.3	297.9
<i>trans</i> -2-Hexene	8.26	28.9	31.6	166.1	223.4	266.1	297.9
<i>cis</i> -3-Hexene	8.25	28.7	31.4	161.1	222.6	265.7	297.9
<i>trans</i> -3-Hexene	11.08	28.9	31.7	168.2	225.5	267.4	298.7
Hexylamine		36.5	45.1				
Hexyl methyl ether		34.9	42.1				
1-Hexyne				158.5	207.5	243.3	270.1
Hydrazine	12.7	45.3					
2-Hydroxybenzaldehyde		38.2					
2-Hydroxybenzoic acid			95.1				
2-Hydroxy-2,4,6-cycloheptatrienone			83.7				
2-Hydroxy-1-isopropyl-4-methylbenzene			91.2				
4-Hydroxy-4-methyl-2-pentanone		28.5	47.7				
3-Hydroxypropanonitrile		56.1					
2-Hydroxypyridine			86.6				
3-Hydroxypyridine			88.3				
4-Hydroxypyridine			103.8				
8-Hydroxyquinoline			108.8				
Icosane	69.88	57.5	100.8	588.5	794.0	942.6	1052.7
Icosanoic acid	72.0		199.6				
1-Icosene	34.3	55.9	99.8	574.0	772.7	916.0	1021.7
Indane		39.6	48.8				
Indene			52.9				

TABLE 6.2 Heats of Fusion, Vaporization, and Sublimation and Specific Heat at Various Temperatures of Organic Compounds (*Continued*)

Substance	ΔH_m	ΔH_v	ΔH_s	C_p			
				400 K	600 K	800 K	1000 K
Indole			69.9				
Iodobenzene	9.76	39.5	47.7	130.1	173.3	201.1	220.1
Iodobenzoic acid			87.9				
1-Iodobutane		34.7	40.6				
2-Iodobutane		33.3	38.5				
Iodocyclohexane			47.3				
Iodoethane		29.4	31.9	80.3	103.1	119.9	132.4
1-Iodoheptane			49.8				
Iodomethane		27.3	28.0	51.6	63.9	73.1	80.2
1-Iodo-2-methylpropane		33.5	38.8				
2-Iodo-2-methylpropane	14.5	31.4	35.4	148.8	191.7	221.1	242.3
1-Iodonaphthalene			72.4				
2-Iodonaphthalene			90.8				
1-Iodopentane			45.3				
1-Iodopropane		32.1	36.2	109.9	142.7	166.5	184.2
2-Iodopropane		30.7	34.1	111.2	144.7	168.2	185.5
3-Iodo-1-propene			38.1				
2-Iodotoluene (also 3-, 4-)			54.4				
Isobutanonitrile		32.4	37.2	119.5	156.4	183.0	202.5
Isobutyl acetate		35.9					
Isobutylamine		30.6	33.9				
Isobutylbenzene	12.51	37.8	47.9				
Isobutylcyclohexane			47.6				
Isobutyl dichloroacetate			52.3				
Isobutyl formate		33.6					
Isobutyl isobutanoate		38.2	46.4				
Isobutyl isopropyl ether		31.6	36.6				
Isobutyl methyl ether		28.0	30.1				
Isobutyl propyl ether		28.3	30.3				
Isobutyl trichloroacetate			53.1				
Isobutyl vinyl ether		30.7	34.6				
2-Isopropoxyethanol		40.4	50.1				
Isopropyl acetate		32.9	37.2				
Isopropylamine	7.33	27.8	28.4				
Isopropylbenzene	7.79	37.5	45.1	200.8	277.0	328.9	365.3
Isopropylcyclohexane			44.0				
Isopropylcyclopentane		33.6	39.4				
Isopropylmethylamine		28.7	30.9				
1-Isopropyl-2-methylbenzene	10.0	38.4	50.6				
1-Isopropyl-3-methylbenzene	13.7	38.1	50.0				
1-Isopropyl-4-methylbenzene	9.7	38.2	50.2				
Isopropyl methyl ether		26.1	26.4	138.0	184.8	220.4	247.2
2-Isopropyl-5-methylphenol			91.2				
Isopropyl methyl sulfide	9.4	30.7	34.2	145.1	192.5	229.9	260.6
Isopropyl nitrate		34.9	38.8	150.5	195.9	226.5	247.9
Isopropylpropylamine		32.1	37.2				
Isopropyl propyl sulfide		35.1	41.8				
Isopropyl trichloroacetate			51.9				
Isoquinoline	7.45	49.0	60.3				
Ketene			20.4	59.5	70.7	78.7	86.4

TABLE 6.2 Heats of Fusion, Vaporization, and Sublimation and Specific Heat at Various Temperatures of Organic Compounds (*Continued*)

Substance	ΔH_m	ΔH_v	ΔH_s	C_p			
				400 K	600 K	800 K	1000 K
(-)-Leucine			150.6				
(+)-Limonene			48.1				
Maleic acid			110.0				
Maleic anhydride			71.5				
Malononitrile			79.1				
D-Mannitol	22.6						
Methacrylonitrile		31.8					
Methane	0.94	8.2		40.5	52.2	62.9	71.8
Methane- d_4				48.6	63.4	74.8	83.0
Methanethiol, $\Delta H_t = 0.22^{-135.6}$	5.91	24.6	23.8	58.7	73.5	85.0	94.1
Methanol, $\Delta H_t = 0.6^{-115.8}$	3.18	35.2	37.4	51.4	67.0	79.7	89.5
4-Methoxybenzaldehyde		56.8	64.5				
Methoxybenzene		39.0	46.9				
2-Methoxybenzoic acid			104.7				
3-Methoxybenzoic acid			107.4				
4-Methoxybenzoic acid			109.8				
3-Methoxy-1-butanol		50.8					
2-Methoxyethanol		37.5	45.2				
2-(2-Methoxyethoxy)ethanol		46.6					
2-Methoxyethyl acetate		43.9	50.3				
2-Methoxy-1-propoxyethane		36.3	43.7				
2-Methoxytetrahydropyran			42.7				
1-Methoxy-2,4,6-trinitrobenzene			133.1				
N-Methylacetamide	9.72	59.4					
Methyl acetate		30.3	32.3				
Methyl acetoacetate		36.0					
Methyl acrylate		33.1	29.2				
Methylamine	6.13	25.6	24.4	60.2	78.9	93.9	105.7
4-Methylaniline	18.22						
Methyl benzoate	9.74	43.2	55.6				
2-Methylbenzoic acid	20.17						
3-Methylbenzoic acid	15.72						
4-Methylbenzoic acid	22.73						
1-Methylbicyclo[4.1.0]heptane			39.2				
1-Methylbicyclo[3.1.0]hexane		31.1	34.8				
2-Methyl-1,3-butadiene	4.79	25.9	26.8	133.1	173.2	200.8	221.3
3-Methyl-1,3-butadiene		27.2	28.0	129.7	168.6	197.5	219.2
2-Methylbutane	5.15	24.7	24.9	152.7	208.7	249.8	280.8
3-Methylbutanenitrile		35.1	41.7				
2-Methylbutanethiol		33.8	39.5				
3-Methyl-1-butanethiol	7.5		39.4				
2-Methyl-2-butanethiol $\Delta H_t = 8.0^{-114.0}$	0.6	31.4	35.7	179.0	236.7	279.4	308.8
Methyl butanoate		33.8	39.3				
2-Methylbutanoic acid			46.9				
3-Methylbutanoic acid	7.32	43.2	57.5				
2-Methyl-1-butanol		45.2	55.2				
3-Methyl-1-butanol		44.1	55.6				
2-Methyl-2-butanol, $\Delta H_t = 2.0^{-127.2}$	4.45	39.0	50.1				
3-Methyl-2-butanol		41.8	53.0				

TABLE 6.2 Heats of Fusion, Vaporization, and Sublimation and Specific Heat at Various Temperatures of Organic Compounds (*Continued*)

Substance	ΔH_m	ΔH_v	ΔH_s	C_p			
				400 K	600 K	800 K	1000 K
3-Methyl-2-butanone		32.4	36.8				
2-Methyl-1-butene	7.9	25.5	25.9	138.9	187.1	222.4	248.7
3-Methyl-1-butene	5.4	24.1	23.8	147.5	192.1	225.3	250.3
2-Methyl-2-butene	7.6	26.3	27.1	133.6	181.7	217.8	245.0
Methyl 2-butenolate			41.0				
3-Methyl-1-butyne		26.2	25.8	130.1	169.9	198.3	219.2
2-Methylbutyl acetate		37.5					
Methyl chloroacetate		39.2	46.7				
Methyl cyanoacetate		48.2	61.7				
Methyl cyclobutanecarboxylate		37.1	44.7				
Methylcyclohexane	6.75	31.3	35.4	185.6	269.7	329.5	371.5
1-Methylcyclohexanol		79.0	80				
<i>cis</i> -2-Methylcyclohexanol		48.5	63.2				
<i>trans</i> -2-Methylcyclohexanol		53.0	63.2				
<i>cis</i> -3-Methylcyclohexanol			65.3				
<i>trans</i> -3-Methylcyclohexanol			65.3				
<i>cis</i> -4-Methylcyclohexanol			65.7				
<i>trans</i> -4-Methylcyclohexanol			66.1				
1-Methylcyclohexene			37.9				
Methylcyclopentane	6.93	29.1	31.6	151.1	219.4	267.8	303.1
1-Methyl-1-cyclopentene			32.6	136.0	195.8	238.5	269.0
3-Methyl-1-cyclopentene			31.0	136.4	197.1	239.3	269.9
4-Methyl-1-cyclopentene			32.2	136.4	196.7	238.4	269.5
Methyl cyclopropanecarboxylate		35.3	41.3				
2-Methyldecane		40.3	54.3				
4-Methyldecane		40.7	53.8				
Methyl decanoate			66.7				
Methyl dichloroacetate		39.3	47.7				
Methyldichlorosilane			28.0				
Methyl 2,2-dimethylpropanoate		33.4	38.8				
2-Methyl-1,3-dioxane			38.6				
4-Methyl-1,3-dioxane			39.2				
4-Methyl-1,3-dioxolan-2-one	9.62						
Methyl dodecanoate			77.2				
<i>N</i> -Methylethanediamine		37.6	45.2				
1-Methylethyl acetate		32.9	37.3				
1-Methylethyl thiolacetate		35.7	42.3				
<i>N</i> -Methylformamide			56.2				
Methyl formate	7.45	27.9	28.4	81.6	105.4	121.8	133.9
Methyl 2-furancarboxylate			45.2				
Methylglyoxal			38.1				
2-Methylheptane	11.88	33.3	39.7				
3-Methylheptane	11.38	33.7	39.8				
4-Methylheptane	10.84	33.4	39.7				
Methyl heptanoate			51.6				
2-Methylhexane	8.87	30.6	34.9	211.0	285.9	340.7	381.6
3-Methylhexane		30.9	35.1	212.0	285.9	340.7	381.6
Methyl hexanoate		38.6	48.0				
5-Methyl-1-hexene			34.3				
<i>cis</i> -3-Methyl-3-hexene			36.5				

TABLE 6.2 Heats of Fusion, Vaporization, and Sublimation and Specific Heat at Various Temperatures of Organic Compounds (*Continued*)

Substance	ΔH_m	ΔH_v	ΔH_s	C_p			
				400 K	600 K	800 K	1000 K
<i>trans</i> -3-Methyl-3-hexene			35.9				
Methylhydrazine	10.4	36.1	40.4				
Methyl isobutanoate		32.6	37.3				
Methyl isocyanide			30.8				
1-Methyl-4-isopropylbenzene	9.60	38.2					
3-Methylisoxazole			41.0				
5-Methylisoxazole			41.0				
Methylmercury bromide			67.8				
Methylmercury chloride			64.4				
Methylmercury iodide			65.3				
Methyl methacrylate		36.0	60.7				
Methyl 2-methylbutanoate			41.8				
Methyl-3-methylbutanoate			41.0				
1-Methylnaphthalene $\Delta H_f = 5.0^{32.4}$	6.94	45.5		212.3	292.0	345.1	381.6
2-Methylnaphthalene $\Delta H_f = 5.6^{15.4}$	11.97	46.0	61.7	211.2	290.0	343.2	381.2
Methyl nitrate	8.2	31.6	32.1	91.5	115.2	131.7	143.1
Methyl nitrite		20.9	22.6	76.3	97.7	112.8	123.5
1-Methyl-4-nitrobenzene			79.1				
2-Methylnonane		38.2	49.6				
3-Methylnonane		38.3	49.7				
5-Methylnonane		38.1	49.3				
2-Methyloctane	18.00						
Methyl octanoate			56.4				
Methyl oxirane		27.4	27.9				
2-Methylpentane	6.27	27.8	29.9	184.1	211.7	296.2	331.4
3-Methylpentane	5.30	28.1	30.3	181.9	246.9	294.6	330.1
2-Methyl-2,4-pentanediol		57.3					
3-Methylpentanenitrile		35.1	41.6				
Methyl pentanoate		35.4	43.1				
2-Methylpentanoic acid		52.1	57.5				
2-Methyl-1-pentanol		50.2	55.7				
2-Methyl-2-pentanol		39.6	54.8				
2-Methyl-3-pentanol		41.8	54.4				
3-Methyl-1-pentanol		46.3	62.3				
3-Methyl-2-pentanol		43.4	56.9				
4-Methyl-1-pentanol		44.5	60.5				
4-Methyl-2-pentanol		44.2	50.6				
3-Methyl-3-pentanol		41.8					
2-Methyl-3-pentanone		33.8	39.8				
3-Methyl-2-pentanone		34.2	40.5				
4-Methyl-2-pentanone		34.5	40.6				
2-Methyl-1-pentene		28.1	30.5	170.7	227.6	269.5	300.4
3-Methyl-1-pentene		26.9	28.7	177.8	232.6	272.8	302.5
4-Methyl-1-pentene		27.1	28.7	162.8	221.3	264.0	296.2
2-Methyl-2-pentene		29.0	31.6	163.2	222.6	245.2	297.5
<i>cis</i> -3-Methyl-2-pentene		28.8	31.2	163.2	222.6	265.3	297.5
<i>trans</i> -3-Methyl-2-pentene		29.3	31.5	163.2	222.6	265.3	297.5
<i>cis</i> -4-Methyl-2-pentene		27.6	29.5	167.6	226.4	267.8	299.2

TABLE 6.2 Heats of Fusion, Vaporization, and Sublimation and Specific Heat at Various Temperatures of Organic Compounds (*Continued*)

Substance	ΔH_m	ΔH_v	ΔH_s	C_p			
				400 K	600 K	800 K	1000 K
<i>trans</i> -4-Methyl-2-pentene		28.0	30.0	171.1	229.3	269.9	300.4
4-Methyl-3-penten-2-one		36.1		214.0			
Methyl pentyl ether		32.0	36.9				
Methyl pentyl sulfide		37.4	45.2	203.6	272.2	324.6	366.0
3-Methyl-1-phenyl-1-butanone			59.5				
2-Methyl-1-phenylpropane	12.5	37.8	49.5				
Methyl phenyl sulfide			54.3				
Methyl phenyl sulfone			92.0				
Methylphosphonic acid			48.1				
2-Methylpiperidine			40.5				
2-Methylpropanal			31.5				
2-Methylpropane	4.66	21.3	19.3	124.6	169.5	202.9	227.6
2-Methylpropanenitrile			32.4				
2-Methyl-1-propanethiol	5.0	31.0	34.6	147.7	193.6	225.0	247.6
2-Methyl-2-propanethiol	2.5	28.5	30.8	151.2	199.2	232.3	256.2
$\Delta H_t = 4.1^{-121.6}$							
$\Delta H_t = 0.7^{-116.2}$							
$\Delta H_t = 1.0^{-73.8}$							
Methyl propanoate		32.2	35.9				
2-Methylpropanoic acid	5.02		35.3				
2-Methyl-1-propanol	6.32	41.8	50.8				
2-Methyl-2-propanol	6.79	39.1	46.7	142.9	189.8	222.9	247.5
$\Delta H_t = 0.8^{13}$							
2-Methylpropene	5.93	22.1	20.6	111.2	147.7	175.1	196.0
Methyl propyl ether		26.8	27.6	138.1	183.8	218.7	244.8
Methyl propyl sulfide	9.9	32.1	36.2	144.9	191.9	227.8	255.8
2-Methylpyridine	9.72	36.2	42.5	133.6	186.4	222.6	243.3
3-Methylpyridine	14.18	37.4	44.4	133.1	186.1	222.3	247.8
4-Methylpyridine	11.57	37.5	44.6				
1-Methyl-1 <i>H</i> -pyrrole			40.8				
Methyl salicylate		46.7					
α -Methylstyrene				187.4	254.0	300.4	333.9
<i>cis</i> - β -Methylstyrene				187.4	254.0	300.4	333.9
<i>trans</i> - β -Methylstyrene				189.1	256.1	301.3	334.7
Methyl tetradecanoate			37.0				
2-Methylthiacyclopentane		36.4	41.8				
4-Methylthiazole			37.6				
2-Methylthiophene	9.20	33.9	38.9	123.1	165.6	194.3	214.6
3-Methylthiophene	10.53	34.2	39.4	122.9	164.6	192.3	211.7
Methyl trichloroacetate			48.3				
Methyl tridecanoate			82.7				
Methyl undecanoate			71.4				
5-Methyluracil			134.1				
Morpholine		37.1	44.0				
Naphthalene	18.98	43.2	72.6	180.1(g)	251.5	297.3	329.2
1-Naphthalenecarboxylic acid			110.4				
2-Naphthalenecarboxylic acid			113.6				
1-Naphthol	23.33		91.2				
2-Naphthol	17.51		94.2				
1,4-Naphthoquinone			72.4				

TABLE 6.2 Heats of Fusion, Vaporization, and Sublimation and Specific Heat at Various Temperatures of Organic Compounds (*Continued*)

Substance	ΔH_m	ΔH_v	ΔH_s	C_p			
				400 K	600 K	800 K	1000 K
1-Naphthylamine			90.0				
2-Naphthylamine			88.3				
2-Nitroaniline	16.11		90.0				
3-Nitroaniline	23.68		96.7				
4-Nitroaniline	21.1		109				
Nitrobenzene	11.59	40.8	55.0				
1-Nitrobutane		38.9	48.6	157.5	210.1	247.0	273.6
2-Nitrobutane		36.8	43.8	157.4	211.1	248.7	276.0
Nitroethane	9.85	38.0	41.6	99.0	131.6	154.0	170.2
Nitromethane	9.70	34.0	38.3	70.3	91.7	106.9	117.9
(Nitromethyl)benzene			53.6				
2-Nitrophenol	17.44						
3-Nitrophenol	19.2						
4-Nitrophenol	18.25						
1-Nitronaphthalene			107.1				
1-Nitropropane		38.5	43.4	128.5	171.0	200.7	222.0
2-Nitropropane		36.8	41.3	129.2	172.3	201.8	222.8
2-Nitroso-1-naphthol			56.5				
4-Nitroso-1-naphthol			87.4				
1-Nitroso-2-naphthol			86.6				
2-Nitrotoluene		16.5	47.2				
3-Nitrotoluene		15.0	49.9				
4-Nitrotoluene	16.81	15.5	50.2				
Nonadecane, $\Delta H_t = 13.8^{22.8}$	45.82	56.0	95.8	559.4	754.9	896.3	1000.8
1-Nonadecene	33.5	54.6	94.9	545.0	733.7	869.7	969.9
1-Nonal			72.3	271.1	361.5	426.4	474.5
Nonane, $\Delta H_t = 6.3^{-56.0}$	15.47	36.9	46.4	269.0	364.1	433.3	484.9
1-Nonanethiol	33.5	44.4		291.6	390.3	464.6	521.5
Nonanoic acid	20.28		82.4				
1-Nonanol		54.4	76.9	282.4	379.1	449.6	501.7
2-Nonanone			56.4				
5-Nonanone	24.93		53.3				
1-Nonene	18.08	36.3	45.5	254.6	342.8	406.8	454.0
<i>cis</i> -Octadecafluorodecahydronaphthalene		35.6	45.2				
<i>trans</i> -Octadecafluorodecahydronaphthalene		35.8	45.4				
Octadecafluoropropylcyclohexane		24.5	43.1				
Octadecafluorooctane		33.4	41.1				
Octadecane	61.39	54.5	152.8	530.4	715.8	850.0	949.4
Octadecanedioic acid	56.6						
Octadecanoic acid	56.59		166.5				
Octadecanol			113.4				
1-Octadecene	32.6	53.3	90.0	516.0	694.5	823.4	918.4
<i>cis</i> -9-Octadecenoic acid		64.7					
Octafluorocyclobutane	2.77	23.2		186.1	225.3	245.4	257.3
Octafluorotoluene	11.58						
Octamethylcyclotetrasiloxane		45.6					
Octanal				242.3	322.2	380.3	422.6
Octanamide			110.5				
Octane	20.65	34.4	41.5	240.0	325.0	387.0	433.5
1,8-Octanedioic acid			143.1				

TABLE 6.2 Heats of Fusion, Vaporization, and Sublimation and Specific Heat at Various Temperatures of Organic Compounds (*Continued*)

Substance	ΔH_m	ΔH_v	ΔH_s	C_p			
				400 K	600 K	800 K	1000 K
Octanenitrile		41.3	56.8				
1-Octanethiol	24.3	42.3		262.6	351.3	418.3	469.9
Octanoic acid	21.36	58.5	81.7				
1-Octanol	42.30	46.9	71.0	253.4	340.0	403.3	450.1
(\pm)-2-Octanol		44.4					
(\pm)-3-Octanol		36.5					
4-Octanol		40.5					
2-Octanone	24.42						
1-Octene	15.57	34.1	40.4	225.6	303.7	360.5	402.5
1-Octyne		35.8	42.3	216.5	285.7	336.0	410.9
2-Octyne		37.3	44.5				
3-Octyne		36.9	43.9				
4-Octyne		36.0	42.7				
Oxalic acid			98.0				
Oxaloyl chloride			31.8				
Oxamide			113.0				
Oxetane		28.7	29.9				
2-Oxetanone			47.0				
2-Oxohexamethyleneimine	16.2	54.8	83.3				
4-Oxopentanoic acid	9.22						
1,1'-Oxybis(2-ethoxy)ethane			58.4				
2,2'-Oxybis(ethanol)		52.3	57.3				
Paraldehyde			41.4				
Pentachloroethane	11.34	36.9	45.6	133.7	152.1	162.0	168.1
Pentachlorofluoroethane	1.9						
Pentachlorophenol			67.4				
Pentacyclo- [4.2.0.0 ^{2,5} .0 ^{3,8} .0 ^{4,7}]octane			80.3				
Pentadecane, $\Delta H_t = 9.2^{-2.25}$	34.8	49.5	76.1	443.3	598.6	711.1	794.5
Pentadecanoic acid	50.2		162.7				
1-Pentadecene	28.9	48.7	75.1	428.9	577.3	684.5	763.6
1,2-Pentadiene		27.6	28.7	131.4	170.7	199.6	220.9
cis-1,3-Pentadiene		27.6	28.3	123.4	166.9	196.7	218.4
trans-1,3-Pentadiene		27.0	27.8	130.5	171.1	199.6	220.1
1,4-Pentadiene	6.14	25.2	25.7	131.0	170.2	220.5	
2,3-Pentadiene		28.2	29.5	125.1	164.9	195.0	217.6
Pentaerythritol		92	143.9				
Pentaerythritol tetranitrate			151.9				
Pentafluorobenzene	10.85	32.2	36.3				
Pentafluorobenzoic acid			91.6				
Pentafluoroethane				113.8	137.8	151.1	158.9
Pentafluorophenol	12.85		67.4				
2,3,4,5,6-Pentafluorotoluene	12.99	34.8	41.1				
Pentamethylbenzene	12.3	45.1	60.8	272.0	360.2	423.8	470.0
$\Delta H_t = 2.0^{23.7}$							
2,2,4,4,6-Pentamethylheptane			49.0				
Pentanal			38.8	155.2	205.0	241.4	267.8
Pentanamide			89.3				
Pentane	8.42	25.8	26.4	152.8	207.7	248.1	278.5
1,5-Pentanediol		60.7					

TABLE 6.2 Heats of Fusion, Vaporization, and Sublimation and Specific Heat at Various Temperatures of Organic Compounds (*Continued*)

Substance	ΔH_m	ΔH_v	ΔH_s	C_p			
				400 K	600 K	800 K	1000 K
1,5-Pentanedithiol			59.3				
2,4-Pentanedione		34.3	41.8				
Pentanenitrile	4.73	36.1	43.6				
1-Pentanethiol	17.5	34.9	41.2	175.4	234.0	279.4	315.1
Pentanoic acid	14.16	44.1	62.4				
1-Pentanol	9.83	44.4	57.0	166.3	222.8	264.4	295.4
2-Pentanol		41.4	54.2				
3-Pentanol		43.5	54.0				
2-Pentanone	10.63	33.4	38.4	152.4	202.2	239.0	266.1
3-Pentanone	11.59	33.5	38.5				
1-Pentene	5.81	25.2	25.5	138.5	186.4	221.5	247.7
<i>cis</i> -2-Pentene	7.12	26.1	26.9	132.1	182.5	218.8	245.9
<i>trans</i> -2-Pentene	8.36	26.1	26.8	136.7	184.2	219.5	246.1
<i>cis</i> -2-Pentenitrile		36.4	43.2				
<i>trans</i> -2-Pentenitrile		37.8	44.9				
<i>trans</i> -3-Pentenitrile		37.1	44.8				
Pentyl acetate		41.0					
Pentylamine		34.0	40.1				
Pentylcyclohexane			53.9				
Pentyl propyl ether		35.0	42.8				
1-Pentyne		27.7	28.4	130.1	169.0	197.1	218.4
2-Pentyne		29.3	30.8	122.2	161.9	192.1	215.1
Perylene	31.75						
α -Phellandrene			50.6				
Phenanthrene	16.46	55.7	75.5				
9,10-Phenanthrenedione			91.6				
Phenazine			99.9				
Phenol	11.29	45.7	57.8	135.8	182.2	211.8	232.2
Phenyl acetate			54.8				
Phenylacetone		52.9					
Phenylacetylene			41.8	150.4	200.9	233.4	255.9
(-)-3-Phenyl-1-alanine			155.2				
α -Phenylbenzeneacetic acid	31.27						
Phenyl benzoate			99.0				
Phenylboron dichloride			33.9				
Phenylcyclopropane			50.2				
<i>N</i> -Phenyldiacetamide			90.0				
Phenyl formate			52.9				
Phenylhydrazine	16.43		61.7				
1-Phenyl-1-propanone			58.5				
1-Phenyl-2-propanone			49.0				
Phenyl salicylate			92.1				
Phenyl vinyl ether			49.9				
Phthalamide			57.3				
1,3-Phthalic acid			106.7				
1,4-Phthalic acid			98.3				
Phthalic anhydride			88.7				
Phthalonitrile			86.9				
Piperidine	14.85	31.7	39.3				
Propadiene		18.6		72.0	92.1	106.4	117.2

TABLE 6.2 Heats of Fusion, Vaporization, and Sublimation and Specific Heat at Various Temperatures of Organic Compounds (*Continued*)

Substance	ΔH_m	ΔH_v	ΔH_s	C_p			
				400 K	600 K	800 K	1000 K
Propanal		28.3	29.6	96.6	126.4	148.3	164.0
Propanamide	17.6		85.9				
Propane	3.53	19.0	14.8	94.0	128.7	154.8	174.6
1,2-Propanediamine			44.2				
1,3-Propanediamine		40.9	50.2				
Propanedinitrile			79.1				
1,2-Propanediol		54.1	58.0				
1,3-Propanediol		57.9	37.1				
1,2-Propanedione			38.1				
1,2-Propanedithiol			49.7				
Propanenitrile, $\Delta H_t = 1.7^{-96.2}$	5.05	31.8	36.0	88.6	114.7	134.5	149.4
1-Propanethiol, $\Delta H_t = 4.0^{-131.1}$	5.5	29.5	31.9	116.6	153.6	182.4	205.1
2-Propanethiol	5.7	27.9	29.5	118.6	154.9	181.0	200.5
1,2,3-Propanetriol triacetate		57.8	85.7				
1,2,3-Propanetriol trinitrate	21.9						
Propanoic acid	10.66	32.3	32.1				
Propanoic anhydride		41.7	52.6				
1-Propanol	5.20	41.4	47.4	108.2	144.6	171.7	192.2
2-Propanol	5.37	39.9	45.4	112.0	149.6	176.3	195.9
Propanolactone			47.0				
2-Propenal		28.3	31.3				
Propene	3.00	18.4	14.2	80.5	108.0	128.7	144.4
2-Propenenitrile	6.23						
Propenoic acid	11.16						
2-Propen-1-ol		40.0	47.3	95.4	126.0	147.6	163.4
cis-1-Propenylbenzene				187.4	254.0	300.4	333.9
2-Propoxyethanol		41.4	52.1				
Propyl acetate		33.9	39.7				
1-Propylamine	10.97	29.6	31.3	119.3	159.0	188.0	210.1
Propylbenzene	9.27	38.2	46.2	200.1	275.6	327.6	364.7
Propyl benzoate		49.8	51.9				
Propyl carbamate			81.2				
Propyl chloroacetate			48.5				
Propylcyclohexane	10.37	36.1	45.1	247.3	350.6	423.4	474.5
Propylcyclopentane	10.0	34.7	41.1	212.7	297.2	361.0	407.9
Propylene oxide	6.5	27.4	28.3	92.7	125.8	149.3	166.5
Propyl formate		33.6	37.5				
Propyl nitrate		35.9	40.6	149.8	194.5	225.4	247.2
Propyl propanoate		35.5	43.5				
Propyl trichloroacetate			53.1				
Propyl vinyl ether			29.3				
Propyne		22.1		72.5	91.2	105.2	115.9
2-Propyn-1-ol		42.1					
Pyrazine			56.3				
Pyrene	17.11						
Pyridazine			53.5				
Pyridine	8.28	35.1	40.2	106.4	149.5	177.8	197.4
Pyrimidine		49.8	50.0				
1H-Pyrrole	7.91	38.8	45.1				
Pyrrolidine, $\Delta H_t = 0.5^{-66}$	8.58	33.0	37.6	114.4	168.7	206.5	233.6

TABLE 6.2 Heats of Fusion, Vaporization, and Sublimation and Specific Heat at Various Temperatures of Organic Compounds (*Continued*)

Substance	ΔH_m	ΔH_v	ΔH_s	C_p			
				400 K	600 K	800 K	1000 K
Quinoline	10.66	49.7	53.9				
Salicylic acid			95.1				
5,5'-Spirobis(1,3-dioxane)			72.8				
Spiro[2.2]pentane	5.8	26.8	27.5	119.5	167.8	200.5	223.9
<i>cis</i> -Stilbene			69.0				
<i>trans</i> -Stilbene	27.4		99.2				
Styrene	11.0	38.7	43.9	160.3	218.2	256.9	284.2
Succinic acid	32.95		117.5				
Succinic anhydride	20.41						
Succinonitrile	3.92						
<i>p</i> -Terphenyl	35.5						
1,1,2,2-Tetrabromoethane		48.7	70.0				
Tetrabromomethane		45.1	110	97.1	102.6	106.7	105.9
Tetrabutyltin			19.8				
Tetracene			125.5				
Tetrachloro-1,4-benzoquinone			98.7				
1,1,2,2-Tetrachloro-1,2-difluoroethane	3.70	35.0					
1,1,1,2-Tetrachloro-2,2-fluorooctane	3.99						
1,1,1,2-Tetrachloroethane				118.7	139.2	151.6	159.7
1,1,2,2-Tetrachloroethane		37.6	45.7	116.7	137.7	150.0	158.0
Tetrachloroethylene	10.56	34.7	39.7	105.0	116.6	122.6	125.8
Tetrachloromethane	3.28	29.8	32.4	91.7	99.7	103.1	104.8
$\Delta H_t = 4.6^{-47.9}$							
Tetracyanoethylene			81.2				
Tetracyanomethane			61.1				
Tetradecane	45.6	47.6	71.3	414.3	559.5	664.8	743.1
Tetradecanenitrile			85.3				
Tetradecanoic acid	45.38		139.8				
1-Tetradecanol	49.0		102.2				
1-Tetradecene	27.6	46.9	70.2	399.8	538.2	638.2	712.1
Tetraethylene glycol		62.6	98.7				
Tetraethylgermanium			44.8				
Tetraethyllead			56.9				
Tetraethylsilane	13.01						
Tetraethyltin			51.0				
1,1,1,2-Tetrafluoroethane				104.2	128.7	143.1	152.1
Tetrafluoroethylene	7.7	16.8		91.9	106.8	115.5	120.8
Tetrafluoromethane	0.7	12.6		72.4	86.8	94.5	98.8
$\Delta H_t = 1.5^{-196.9}$							
Tetrahydrofuran	8.54	29.8	32.0				
Tetrahydrofuran-2,5-dimethanol		63.6					
Tetrahydrofuran-2-methanol		45.2	51.6				
1,2,3,4-Tetrahydronaphthalene	12.45	43.9	55.2				
Tetrahydropyran		31.2	34.6				
Tetrahydropyran-2-methanol		44.4					
Tetrahydrothiophene		34.7	39.4				
Tetrahydrothiophene-1,1-dioxide	1.43						
Tetraiodomethane				100.4	104.4	105.9	106.7
Tetramethoxysilane		194.6					
1,2,3,4-Tetramethylbenzene	11.2	45.0	57.2	237.7	316.7	374.1	416.2

TABLE 6.2 Heats of Fusion, Vaporization, and Sublimation and Specific Heat at Various Temperatures of Organic Compounds (*Continued*)

Substance	ΔH_m	ΔH_v	ΔH_s	C_p			
				400 K	600 K	800 K	1000 K
1,2,3,5-Tetramethylbenzene	10.7	43.8	53.7	233.3	313.0	371.5	414.3
1,2,4,5-Tetramethylbenzene	21.0	45.5	53.4	232.2	311.2	369.9	413.0
2,2,3,3-Tetramethylbutane	7.54	31.4	42.9				
$\Delta H_t = 2.0^{-120.7}$							
Tetramethylene sulfone	1.4	61.5					
Tetramethyllead			38.1				
2,2,3,3-Tetramethylpentane	2.33						
2,2,3,4-Tetramethylpentane	0.50						
2,2,4,4-Tetramethylpentane	9.75	32.5	38.5				
2,3,3,4-Tetramethylpentane	9.00						
Tetramethylsilane	6.88						
Tetramethyltin			33.1				
1,1,3,3-Tetramethylurea	14.10	45.6					
Tetranitromethane		40.7	49.9				
Tetraphenylmethane			150.6				
Tetraphenyltin			66.3				
Tetrapropylgermanium			61.5				
Tetrapropyltin			66.9				
1,2,3,4-(1 <i>H</i>)-Tetrazole			97.5				
Thiacyclobutane		32.3	36.0				
Thiacycloheptane			47.3	175.7	272.0	330.5	368.2
Thiacyclohexane	2.5	36.0	42.6	149.4	219.1	267.8	302.7
$\Delta H_t = 1.1^{-71.8}$							
$\Delta H_t = 7.8^{-33.1}$							
Thiacyclopentane	7.4	34.7	39.5	121.1	167.5	199.4	222.3
Thiacyclopropane		29.2	30.3	69.2	92.0	107.2	118.0
Thioacetamide			83.3				
Thioacetic acid			37.2	93.1	111.8	127.2	136.5
1,2-Thiocresol			51.5				
2,2'-Thiodiethanol		66.8					
Thiophene, $\Delta H_t = 0.6^{-101.6}$	5.09	31.5	34.7	96.3	129.5	150.7	165.4
Thiophenol	11.5	39.9	47.6	137.1	184.6	215.9	237.6
Thymol	17.27						
Toluene	6.85	33.2	38.0	140.1	197.5	236.9	264.9
<i>o</i> -Toluidine		44.6	56.7				
<i>m</i> -Toluidine	3.89	44.9	57.3				
<i>p</i> -Toluidine	18.22	44.3					
Triacetamide			60.4				
2,4,6-Triamino-1,3,5-triazine			124.3				
Tribromomethane		39.7	46.1	78.7	88.0	93.3	96.7
Tributoxyborane		56.1	52.3				
Tributyl phosphate		61.4	72.0				
Trichloroacetic acid	5.88						
Trichloroacetonitrile		34.1					
Trichloroacetyl chloride			41.0				
1,3,5-Trichlorobenzene	18.2						
Trichlorobenzoquinone			88.7				
1,1,1-Trichloroethane	2.73	29.9	32.5	107.6	128.4	141.1	149.8
$\Delta H_t = 7.5^{-49.0}$							
1,1,2-Trichloroethane	11.54	34.8	40.2	104.7	126.1	139.2	148.2

TABLE 6.2 Heats of Fusion, Vaporization, and Sublimation and Specific Heat at Various Temperatures of Organic Compounds (*Continued*)

Substance	ΔH_m	ΔH_v	ΔH_s	C_p			
				400 K	600 K	800 K	1000 K
Trichloroethylene		31.4	34.5	91.2	104.9	112.7	117.8
Trichloromethane	8.8	29.2	31.3	74.3	85.3	91.5	95.5
Trichloromethylsilane	8.94						
1,2,3-Trichloropropane	8.9	37.1		31.7	38.9	43.8	47.3
1,1,1-Trichlorotrifluoroethane		26.9	28.1				
1,1,2-Trichlorotrifluoroethane	2.47	27.0	28.4				
1,1,1-Trichloro-3,3,3-trifluoropropane		32.2	36.8				
Tricyanoethylene			81.2				
Tridecane, $\Delta H_t = 7.7-18.2$	28.50	45.7	66.4	385.2	520.4	618.5	691.2
Tridecanenitrile			85.3				
Tridecanoic acid	43.1		146.4				
1-Tridecene	22.83	45.0	65.3	370.8	499.1	592.0	660.2
Triethanolamine	27.2	67.5					
Triethoxyborane			43.9				
Triethoxymethane			46.0				
Triethylaluminum			73.2				
Triethylamine		31.0	34.8	203.8	276.6	328.7	367.4
Triethylaminoborane			60.7				
Triethylarsine			43.1				
Triethyl arsenite			50.6				
Triethylbismuthine			46.0				
Triethylborane			36.8				
Triethylenediamine	6.1		61.9				
$\Delta H_t = 9.6^{79.8}$							
Triethylene glycol		71.4	79.1				
Triethylphosphine			39.8				
Triethyl phosphate			57.3				
Triethyl phosphite			41.8				
Triethylstibine			43.5				
Trifluoroacetic acid		33.3	38.5				
$\Delta H(\text{dimer dissoc}) = 58.8^{100}$							
Trifluoroacetonitrile	5.0						
1,1,1-Trifluoro-2-bromo-2-chloroethane		28.1	29.6				
1,1,1-Trifluoroethane	6.19	19.2		95.2	118.7	133.8	144.1
2,2,2-Trifluoroethanol		40.0					
Trifluoroethylene				81.1	97.5	107.5	113.9
Trifluoromethane	4.1	16.7		61.1	76.0	85.1	91.0
(Trifluoromethyl)benzene	13.46	32.6	37.6	169.8	226.8	262.6	286.4
Triiodomethane	16.3		69.9	82.0	90.0	94.7	97.8
Triisopropylborane			41.8				
Triisopropyl phosphite			46.0				
Trimethoxyborane			34.7				
1,1,1-Trimethoxyethane			39.2				
Trimethoxymethane			38.1				
2',4',5'-Trimethylacetophenone			63.2				
2',4',6'-Trimethylacetophenone			62.3				
Trimethylaluminum			63.2				
Trimethylamine	6.55	22.9	21.7	117.5	160.4	190.9	213.3
Trimethyl arsenite			42.3				
Trimethylarsine			28.9				

TABLE 6.2 Heats of Fusion, Vaporization, and Sublimation and Specific Heat at Various Temperatures of Organic Compounds (*Continued*)

Substance	ΔH_m	ΔH_v	ΔH_s	C_p			
				400 K	600 K	800 K	1000 K
1,2,3-Trimethylbenzene $\Delta H_f = 0.7^{-54.5}$ $\Delta H_v = 1.3^{-42.9}$	8.37	40.0	49.1	196.2	267.8	320.9	359.4
1,2,4-Trimethylbenzene		39.3	47.9	196.5	269.0	321.9	360.2
1,3,5-Trimethylbenzene	9.51	39.0	47.5	194.2	268.1	321.5	360.1
2,6,6-Trimethylbicyclo[3.1.1]-2-heptene			44.8				
Trimethylbismuthine			34.7				
Trimethylborane			20.2				
2,2,3-Trimethylbutane $\Delta H_f = 2.5^{-151.8}$	2.20	28.9	32.0	212.7	291.3	346.1	386.3
2,3,3-Trimethyl-1-butene			32.2				
<i>cis,cis</i> -1,3,5-Trimethylcyclohexane				242.9	351.2	427.6	482.0
Trimethylene oxide		28.7	29.9				
Trimethylene sulfide $\Delta H_f = 0.7^{-96.5}$	8.3	32.3	36.0	91.6	127.4	152.3	170.2
Trimethylgallium			38.1				
2,2,5-Trimethylhexane	6.2	33.7	40.2				
2,3,5-Trimethylhexane	10.00	34.4	41.4				
Trimethylindium			48.5				
2,4,7-Trimethyloctane		38.2	49.9				
2,2,3-Trimethylpentane	8.62	31.9	36.9				
2,2,4-Trimethylpentane	9.04	30.8	35.1				
2,3,3-Trimethylpentane $\Delta H_f = 7.7^{-109.0}$	0.86	32.1	37.3				
2,3,4-Trimethylpentane	9.27	32.4	37.7				
2,2,4-Trimethyl-1,3-pentanediol	8.6	55.7					
2,2,4-Trimethyl-3-pentanone		35.6	43.3				
2,4,4-Trimethyl-1-pentene		31.4	35.8				
2,4,4-Trimethyl-2-pentene		32.6	37.5				
Trimethylphosphine			28.0				
Trimethylphosphine oxide			50.2				
Trimethyl phosphate			36.8				
2,3,6-Trimethylpyridine		40.0	50.6				
2,4,6-Trimethylpyridine	9.53	39.9	50.3				
Trimethylsilanol			45.6				
Trimethylstibine			31.4				
Trimethylsuccinic anhydride			74.1				
Trimethylthiacyclopropane			39.3				
Trimethyltin bromide			47.3				
2,4,6-Trinitroanisole			133.1				
1,3,5-Trinitrobenzene	16.7		99.6				
Trinitromethane		32.6	46.7				
2,4,6-Trinitrophenetole			120.5				
2,4,6-Trinitrotoluene			104.7				
1,3,6-Trioxacycloactane			48.8				
1,3,5-Trioxane	15.11		56.6				
Triphenylarsine			99.3				
Triphenylbismuthine			110.9				
Triphenylborane			81.6				
Triphenylene			118.0				

TABLE 6.2 Heats of Fusion, Vaporization, and Sublimation and Specific Heat at Various Temperatures of Organic Compounds (*Continued*)

Substance	ΔH_m	ΔH_v	ΔH_s	C_p			
				400 K	600 K	800 K	1000 K
Triphenylmethane			100.0				
Triphenylphosphine			96				
Triphenylstibine			106.3				
Tripropoxyborane			49.4				
Tris(diethylamino)phosphine			60.7				
Tris(trimethylsilyl)amine			54.4				
Tropolone			83.7				
Undecane	22.32	41.5	56.4	327.1	442.7	525.9	588.3
$\Delta H_f = 6.9^{-36.6}$							
Undecanenitrile			71.1				
Undecanoic acid	25.9		121.3				
1-Undecene, $\Delta H_f = 9.2^{-55.8}$	16.99	40.9	55.4	312.7	421.1	499.3	557.3
Uracil			126.5				
Urea	15.1	87.9					
(-)-Valine			162.8				
Vinyl acetate		34.4	34.8				
Vinyl benzene			39.6				
Vinylcyclohexane			39.7				
4-Vinyl-1-cyclohexene		33.5	38.3				
1,2-Xylene	13.61	36.2	43.4	171.7	234.2	278.8	311.1
1,3-Xylene	11.55	35.7	42.7	167.5	232.2	277.9	310.6
1,4-Xylene	16.81	35.7	42.4	166.1	230.8	276.7	309.7

TABLE 6.3 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of the Elements and Inorganic Compounds

Substance	Physical State	$\Delta_f H^\circ$ kJ · mol ⁻¹	$\Delta_f G^\circ$ kJ · mol ⁻¹	S° J · deg ⁻¹ · mol ⁻¹	C_p° J · deg ⁻¹ · mol ⁻¹
Actinium					
Ac	c	0	0	56.5	27.2
Aluminum					
Al	c	0	0	28.30(10)	24.4
	g	330.0(40)	289.4	164.554(4)	21.4
Al ³⁺ std. state	aq	-538.4(15)	-485.3	-325.(10)	
Al ₆ BeO ₁₀	c	-5624	-5317	175.6	265.19
Al(BH ₄) ₃	lq	-16.3	145.0	289.1	194.6
AlBr ₃	c	-527.2	-488.5	180.2	100.58
std. state	aq	-895	-799	-74.5	
Al ₄ C ₃	c	-216	-203	89	
Al(CH ₃) ₃	lq	136.4	-10.0	209.4	155.6
Al(OAc) ₃	c	-1892.4			
AlCl ₃	c	-704.2	-628.8	109.29	91.13
std. state	aq	-1033	-878	-152.3	
AlCl ₃ · 6H ₂ O	c	-2692	-2269	377	
AlF ₃	c	-1510.4(13)	-1431.1	66.5(5)	75.13
std. state	aq	-1531.0	-1322	-363.2	

TABLE 6.3 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of the Elements and Inorganic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ · mol ⁻¹	$\Delta_f G^\circ$ kJ · mol ⁻¹	S° J · deg ⁻¹ · mol ⁻¹	C_p° J · deg ⁻¹ · mol ⁻¹
AlF ₃ · H ₂ O	c	-2297	-2052	209	
AlH ₃	c	-46.0		30.0	40.2
AlI ₃	c	-313.8	-300.8	159.0	98.7
std. state	aq	-699	-640	12.1	
AlK(SO ₄) ₂ · 12H ₂ O	c	-6061.8	-5141.7	687.4	651.0
AlN	c	-318.1	-287.0	20.14	30.10
Al(NO ₃) ₃ std. state	aq	-1155	-820	117.6	
Al(NO ₃) ₃ · 6H ₂ O	c	-2850.5	-2203.9	467.8	433.0
Al(NO ₃) ₃ · 9H ₂ O	c	-3757.1	-2929.6	569	
AlO ₂ ⁻ std. state	aq	-930.9	-830.9	-36.8	
Al ₂ O ₃ corundum	c	-1675.7(13)	-1582.3	50.92(10)	79.15
Al(OH) ₃	c	-1284	-1306	71	93.1
Al(OH) ₄ ⁻ std. state	aq	-1502.5	-1305.3	102.9	
AlP	c	-166.5			
AlPO ₄ berlinite	c	-1733.8	-1618.0	90.79	93.18
Al ₂ S ₃	c	-724.0	-640	116.85	105.06
Al ₂ Se ₃	c	-565			
Al ₂ SiO ₅ andalusite	c	-2592.0	-2444.8	93.2	122.76
Al ₂ (SO ₄) ₃	c	-3435	-3507	239.3	259.4
std. state	aq	-3790	-3205	-583.3	
Al ₂ Te ₃	c	-326			
Americium					
Am	c	0	0	62.7	
Am ³⁺	aq	-682.8	-671.5	-159.0	
Am ⁴⁺	aq	-511.7	-461.1	-372	
Am ₂ O ₃	c	-1757	-1678	154.7	
AmO ₂	c	-1005.0	950.2	96.2	
Ammonium					
NH ₃	g	-45.94(35)	-16.4	192.776(5)	35.65
undissoc; std. state	aq	-80.29	-26.57	111.3	
ND ₃	g	-58.6	-26.0	203.9	38.23
NH ₄ ⁺ std. state	aq	-133.26(25)	-79.37	111.17(40)	79.9
NH ₄ OH undissoc; std. state	aq	-361.2	-254.0	165.5	
ionized; std. state	aq	-362.50	-236.65	102.5	-68.6
NH ₄ OAc	c	-616.14			
std. state	aq	-618.52	-448.78	200.0	73.6
NH ₄ Al(SO ₄) ₂	c	-2352.2	-2038.4	216.3	226.44
std. state	aq	-2481	-2054	-168.2	
NH ₄ AsO ₂ std. state	aq	-561.54	-429.41	154.8	
NH ₄ H ₂ AsO ₃ std. state	c	-847.30	-666.60	223.8	
NH ₄ H ₂ AsO ₄	c	-1059.8	-833.0	172.05	151.17
std. state	aq	-1042.07	-832.66	230.5	
(NH ₄) ₂ HAsO ₄ std. state	aq	-1171.1	-873.20	225.1	
(NH ₄) ₃ AsO ₄ std. state	aq	-1286.7	-886.63	177.4	
NH ₄ Br	c	-271.8	-175.2	113.0	96.0
std. state	aq	-254.05	-183.34	194.97	-61.9
NH ₄ BrO ₃	aq	-199.58	-60.84	275.10	
NH ₄ carbamate	c	-657.60	-448.07	133.5	
NH ₄ Cl	c	-314.5	-202.9	94.6	84.1
std. state	aq	-299.66	-210.62	169.9	-56.5
NH ₄ ClO ₃ std. state	aq	-236.48	-87.40	275.7	

TABLE 6.3 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of the Elements and Inorganic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ · mol ⁻¹	$\Delta_f G^\circ$ kJ · mol ⁻¹	S° J · deg ⁻¹ · mol ⁻¹	C_p° J · deg ⁻¹ · mol ⁻¹
NH ₄ ClO ₄	c	-295.3	-88.8	186.2	128.1
std. state	aq	-261.84	-87.99	295.4	
NH ₄ CN	c	0.4			134.0
std. state	aq	18.0	92.9	207.5	
NH ₄ CNO cyanate	aq	-278.7	-177.0	220.1	
std. state					
(NH ₄) ₂ CO ₃ std. state	aq	-942.15	-686.64	169.9	
(NH ₄) ₂ C ₂ O ₄ oxalate	c	-1123.0			226.0
(NH ₄) ₂ CrO ₄	c	-1167.3			
std. state	aq	-1144.3	-886.59	277.0	
(NH ₄) ₂ Cr ₂ O ₇	aq	-1755.2	-1459.5	488.7	
NH ₄ dithiocarbonate	c	-126.8			
NH ₄ F	c	-463.96	-348.78	71.97	65.27
std. state	aq	-465.14	-358.19	99.6	-26.8
NH ₄ formate std. state	aq	-558.06	-430.5	205.0	-7.9
NH ₄ HCO ₃	c	-849.4	-665.9	120.9	
	aq	-824.5	-666.1	204.6	
NH ₄ I	c	-201.4	-112.5	117.0	81.8
std. state	aq	-187.69	-130.96	224.7	-62.3
NH ₄ IO ₃	c	-385.8			
std. state	aq	-354.0	-207.5	231.8	
NH ₄ N ₃ azide	c	115.5	274.1	112.6	
	aq	142.7	268.6	221.3	
NH ₄ NO ₂	aq	-237.2	-111.6	236.4	-17.6
NH ₄ NO ₃	c	-365.56	-184.01	151.08	139.3
std. state	aq	-339.87	-190.71	259.8	-6.7
NH ₄ H ₂ PO ₄	c	-1145.07	-1210.56	151.96	142.26
std. state	aq	-1428.79	-1209.76	203.8	
(NH ₄) ₂ HPO ₄	c	-1556.91		188.0	
std. state	aq	-1557.16	-1248.00	193.3	
NH ₄ H ₂ P ₂ O ₇	aq	-2409.1	-2102.6	326.0	
NH ₄ HS	c	-156.9	-50.6	97.5	
	aq	-150.2	-67.2	176.1	
NH ₄ HSO ₃	aq	-758.7	-607.0	253.1	
NH ₄ HSO ₄	c	-1026.96			
std. state	aq	-1019.85	-835.38	245.2	-3.8
(NH ₄) ₃ PO ₄	c	-1671.9			
std. state	aq	-1674.9	-1256.9	117	
(NH ₄) ₄ P ₂ O ₇ std. state	aq	-2801.2	-2236.8	335	
(NH ₄) ₂ PtCl ₆	c	-803.3			237.7
NH ₄ ReO ₄	c	-945.6	-774.9	232.6	
(NH ₄) ₂ S	aq	-231.8	-72.8	212.1	
NH ₄ SCN	aq	-56.1	13.4	257.7	39.7
NH ₄ HSeO ₄ std. state	aq	-714.2	-531.6	262.8	
(NH ₄) ₂ SeO ₄	aq	-864.0	-599.8	280.7	
(NH ₄) ₂ SiF ₆	c	-2681.69	-2365.3	280.24	228.11
(NH ₄) ₂ SO ₃	aq	-900.4	-645.0	197.5	
(NH ₄) ₂ SO ₄	c	-1180.9	-901.70	220.1	187.49
std. state	aq	-1174.28	-903.37	246.9	-133.1
(NH ₄) ₂ S ₂ O ₈	c	-1648.08			
std. state	aq	-1610.0	-1273.6	471.1	
NH ₄ VO ₃	c	-1053.1	-888.3	140.6	129.33

TABLE 6.3 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of the Elements and Inorganic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ · mol ⁻¹	$\Delta_f G^\circ$ kJ · mol ⁻¹	S° J · deg ⁻¹ · mol ⁻¹	C_p° J · deg ⁻¹ · mol ⁻¹
Antimony					
Sb	c	0	0	45.7	25.2
	g	262.3	222.1	180.3	20.8
SbBr ₃	c	-259.4	-239.3	207.1	
	g	-194.6	-223.9	372.9	80.2
SbCl ₃	c	-382.0	-323.7	184.1	107.9
SbCl ₅	lq	-440.16	-350.2	301	
SbF ₃	c	-915.5			
SbH ₃	g	145.11	147.74	232.8	41.05
SbI ₃	c	-100.4		215.5	97.57
Sb ₂ O ₃	c	-708.8		123.01	101.25
Sb ₂ O ₅	c	-971.9	-829.2	125.1	117.61
Sb ₂ S ₃	c	-174.9		182.0	117.74
Sb ₂ Te ₃	c	-56.5	-55.2	234	
Argon					
Ar	g	0	0	154.846(3)	20.79
Arsenic					
As gray	c	0	0	35.1	24.64
AsBr ₃	g	-130.0	-159.0	363.9	79.16
AsCl ₃	lq	-305.0	-259.4	216.3	133.5
	g	-261.5	-248.9	327.06	75.73
AsF ₃	lq	-821.3	-774.2	181.2	126.2
	g	-785.8	-770.8	289.1	65.6
AsH ₃	g	66.44	68.91	222.8	38.07
AsI ₃	c	-58.2	-59.4	213.05	105.77
AsO ₂ ⁻	aq	-429.0	-350.0	40.6	
AsO ₄ ³⁻	aq	-888.1	-648.4	-162.8	
As ₂ O ₃	c	-924.87	-782.3	105.4	116.5
As ₄ O ₆ octahedral	c	-1313.94	-1152.52	214.2	191.29
As ₂ S ₃	c	-169.0	-168.6	163.6	116.3
Astatine					
At	c	0	0	121.3	
Barium					
Ba	c	0	0	62.48	28.10
Ba ²⁺ std. state	aq	-537.64	-560.74	9.6	
Ba(OAc) ₂ acetate	c	-1484.5			
std. state	aq	-1509.67	-1299.55	182.8	
BaBr ₂	c	-757.3	-736.8	146.0	77.0
std. state	aq	-780.73	-768.68	174.5	
BaBr ₂ · 2H ₂ O	c	-1366.1	-1230.5	226	
Ba(BrO ₃) ₂	c	-752.66	-577.4	243	
BaC ₂ O ₄ oxalate	c	-1368.6			
BaCl ₂	c	-855.0	-806.7	123.67	75.14
BaCl ₂ · 2H ₂ O	c	-1456.9	-1293.2	202.9	161.96
Ba(ClO ₃) ₂	c	-762.7			
Ba(ClO ₃) ₂ · H ₂ O	c	-1691.6	-1270.7	393	
BaCO ₃ witherite	c	-1213.0	-1134.4	112.1	86.0
BaCrO ₄	c	-1446.0	-1345.3	158.6	
BaF ₂	c	-1207.1	-1156.8	96.4	71.20
std. state	aq	-1202.90	-1118.38	-17.0	
Ba(HCO ₃) ₂ std. state	aq	-1921.63	-1734.4	192.1	

TABLE 6.3 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of the Elements and Inorganic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ · mol ⁻¹	$\Delta_f G^\circ$ kJ · mol ⁻¹	S° J · deg ⁻¹ · mol ⁻¹	C_p° J · deg ⁻¹ · mol ⁻¹
Ba(H ₂ PO ₃) ₂	c	-1762.3			
BaI ₂	c	-602.1	-601.4	165.1	77.49
std. state	aq	-648.02	-663.92	232.2	
Ba(IO ₃) ₂	c	-1027.2	-864.8	249.4	187.4
std. state	aq	-980.3	-816.7	246.4	
BaMnO ₄	c	-1548	-1439.7	138	140.6
BaMoO ₄	c	-1507.5	-1439.7	144.3	114.7
Ba(NO ₂) ₂	c	-768.2			
Ba(NO ₃) ₂	c	-988.0	-792.6	213.8	151.38
std. state	aq	-952.36	-783.41	302.5	
BaO	c	-548.0	-520.4	72.07	47.28
BaO ₂	c	-634.3			
Ba(OH) ₂	c	-944.7	-859.5	107	101.6
Ba(OH) ₂ · H ₂ O	c	-3342.2	-2793.2	427	
BaS	c	-460.0	-456.0	78.2	49.37
BaSe	c	-372			
BaSeO ₃	c	-1040.6	-968.2	167	
BaSiF ₆	c	-1952.2	-2794.1	163	
BaSO ₃	c	-1179.5			
BaSO ₄	c	-1473.19	-1362.2	132.2	101.75
BaTiO ₃	c	-1659.8	-1572.4	108.0	102.47
Beryllium					
Be	c	0	0	9.50(8)	16.38
	g	324.(5)		136.275(3)	
Be ²⁺ std. state	aq	-382.8	-379.7	-129.7	
BeAl ₂ O ₄ chrysoberyl	c	-2301.0	-2178.5	66.29	105.38
BeBr ₂	c	-353.5	-337	108.0	69.4
Be ₂ C	c	91	-88	16.3	43.2
BeCl ₂ β form	c	-490.4	-445.6	75.81	62.43
BeCO ₃	c	1025.0		52.0	65.0
BeF ₂ α form	c	-1026.8	-979.4	53.35	51.82
BeI ₂	c	-192.5	-187	121.0	71.1
Be ₃ N ₂ cubic	c	-588.3	-532.9	34.13	64.36
BeO α form	c	-609.4(25)	-580.1	13.77(4)	25.56
BeO ₂ ⁻	aq	-790.8	-640.1	-159.0	
3BeO · B ₂ O ₃	c	-3105	-2939	100	139.7
Be(OH) ₂ β form	c	-902.5	-815.0	45.5	62.1
BeS	c	-234.3	-233.0	34.0	34.0
BeSeO ₄	c	-1205.2	-1093.8	77.9	85.7
std. state	aq	-982.0	-820.9	-75.7	
Be ₂ SiO ₄	c	-2117	-2003	64.19	95.6
BeSO ₄	c	-1200.8	-1089.4	77.97	85.70
std. state	aq	-1290.0	-1124.3	-109.6	
BeSO ₄ · H ₂ O	c	-2423.75	-2080.66	232.97	216.61
BeWO ₄	c	-1513	-1405	88.4	97.3
Bismuth					
Bi	c	0	0	56.7	25.5
	g	207.1	168.2	187.0	20.8
BiBr ₃	c	264	234	226	109
BiCl ₃	c	-379.1	-315.1	177.0	105.0
BiH ₃	g	277.8			

TABLE 6.3 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of the Elements and Inorganic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ · mol ⁻¹	$\Delta_f G^\circ$ kJ · mol ⁻¹	S° J · deg ⁻¹ · mol ⁻¹	C_p° J · deg ⁻¹ · mol ⁻¹
BiI ₃	c	-100.4	-175.3		
Bi ₂ O ₃	c	-574.0	-493.7	151.5	113.5
BiOCl	c	-366.9	-322.2	120.5	
Bi ₂ S ₃	c	-143.1	-140.6	200.4	122.2
Bi ₂ (SO ₄) ₃	c	-2544.3			
Bi ₂ Te ₃	c	-78.24		260.91	152.21
Boron					
B	c	0	0	5.90(8)	11.1
	g	565.(5)		153.436(15)	
BBr ₃	lq	-239.7	-238.5	229.7	128.03
B ₄ C	c	-62.7	-62.1	27.18	53.76
BCl ₃	g	-403.8	-388.7	290.1	62.7
BF ₃	g	-1136.0(8)	-1119.4	254.42(20)	50.45
BF ₄ ⁻ std. state	aq	-1574.9	-1487.0	179.9	
BH ₃	g	100.0	111	187.9	36.22
BH ₄ ⁻ std. state	aq	48.16	114.27	110.5	
B ₂ H ₆ diborane(6)	g	35.6	86.7	232.1	56.9
B ₅ H ₉ pentaborane(9)	lq	42.7	171.8	184.2	151.13
B ₁₀ H ₁₄ decaborane(14)	c	-29.83	212.9	234.9	221.2
BN	c	-254.4	-228.4	14.80	19.72
B ₃ N ₃ H ₆ borazine	lq	-541.0	-392.7	199.6	
	g	-510	-389	288.61	96.94
BO ₂ ⁻ std. state	aq	-772.37	-678.94	-37.24	
B ₂ O ₃	c	-1273.5(14)	-1194.3	53.97(30)	62.8
B(OH) ₄ ⁻ std. state	aq	-1344.03	-1153.32	102.5	
B ₃ O ₃ H ₃ boroxin	c	-1262	-11.56	167	98.3
B ₂ S ₃	c	-240.6		100.0	111.7
Bromine					
Br atomic	g	111.87(12)	82.4	175.018(4)	20.8
Br ⁻ std. state	aq	-121.41(15)	-103.97	82.55(20)	-141.8
Br ₂	lq	0	0	152.21(30)	75.67
	g	30.91(11)		245.468(5)	
Br ₃ ⁻ std. state	aq	-130.42	-107.07	215.5	
BrCl	g	14.6	-0.96	239.91	34.98
BrF	g	-93.8	-109.2	229.0	32.97
BrF ₃	lq	-300.8	-240.5	178.2	124.6
	g	-255.6	229.4	292.5	66.6
BrF ₅	lq	-458.6	-351.9	225.1	
	g	-428.9	-351.6	323.2	99.6
BrO ⁻ std. state	aq	-94.1	-33.5	42.0	
BrO ₃ ⁻ std. state	aq	-67.07	18.6	161.71	
BrO ₄ ⁻	aq	13.0	118.1	199.6	
Cadmium					
Cd	c	0	0	51.80(15)	25.9
	g	111.80(20)		167.749(4)	20.8
Cd ²⁺	aq	-75.92(60)		-72.8(15)	
CdBr ₂	c	-316.18	-296.31	137.2	76.7
std. state	aq	-318.99	-285.52	91.6	
CdCl ₂	c	-391.6	-343.9	115.3	74.7
std. state	aq	-410.20	-340.12	39.8	
CdCl ₂ · 5/2H ₂ O	c	-1131.94	-944.08	227.2	

TABLE 6.3 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of the Elements and Inorganic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ · mol ⁻¹	$\Delta_f G^\circ$ kJ · mol ⁻¹	S° J · deg ⁻¹ · mol ⁻¹	C_p° J · deg ⁻¹ · mol ⁻¹
Cd(CN) ₂	c	162.3			
std. state	aq	225.5	267.4	115.1	
CdCO ₃	c	-750.6	-669.4	92.5	
Cd(OAc) ₂ std. state	aq	-1047.9	-816.4	100	
CdF ₂	c	-700.4	-647.7	77.4	
std. state	aq	-741.15	-635.21	-100.8	
CdI ₂	c	-203.3	-201.4	161.1	80.0
std. state	aq	-186.3	-180.8	149.4	
CdI ₄ std. state	aq	-341.8	-315.9	326	
Cd(NH ₃) ₄ ²⁺ std. state	aq	-450.2	-226.4	336.4	
Cd(NO ₃) ₂	c	-456.3			
std. state	aq	-490.6	-300.2	219.7	
CdO	c	-258.35(40)	-228.7	54.8(15)	43.4
Cd(OH) ₂	c	-560.7	-473.6	96.0	
CdS	c	-161.9	-156.5	64.9	55.5
CdSO ₄	c	-933.4	-822.7	123.0	99.6
std. state	aq	-985.2	-822.2	-53.1	
CdSO ₄ · 8/3H ₂ O	c	-1729.30(80)	-1465.3	229.65(40)	213.3
CdSeO ₄	c	-633.0	-531.8	164.4	
std. state	aq	-674.9	-518.8	-19.3	
CdTe	c	-92.5	-92.0	100.0	
Calcium					
Ca	c	0	0	41.59(40)	25.9
	g	177.8(8)		154.887(4)	
Ca ²⁺ std. state	aq	-543.0(10)	-553.54	-56.2(10)	
Ca(OAc) ₂	c	-1479.5			
std. state	aq	-1514.73	-1292.35	120.1	
Ca ₃ (AsO ₄) ₂	c	-3298.7	-3063.1	226	
Ca(BO ₂) ₂	c	-2030.9	-1924.1	104.85	103.98
CaB ₄ O ₇	c	-3360.3	-3167.1	134.7	157.9
CaBr ₂	c	-682.8	-663.6	130.0	75.04
std. state	aq	-785.9	-761.5	111.7	
CaC ₂	c	-59.8	-64.9	69.96	62.72
CaCl ₂	c	-795.4	-748.8	108.4	72.9
std. state	aq	-877.13	-816.05	59.8	
CaCl ₂ · 2H ₂ O	c	-1402.9			738
CaCN ₂ cyanamide	c	-350.6			
Ca(CN) ₂	c	-184.5			
CaCO ₃ calcite	c	-1207.6	-1129.1	91.7	83.5
aragonite	c	-1207.8	-1128.2	88.0	82.3
	aq	-1220.0	-1081.4	-110.0	
CaC ₂ O ₄	c	-1360.6			
CaC ₂ O ₄ · H ₂ O	c	-1674.9	-1514.0	156.5	152.8
CaCrO ₄	c	-1379.1	-1277.4	134	
CaF ₂	c	-1228.0	-1175.6	68.6	67.0
	aq	-1208.1	-1111.2	-80.8	
Ca(formate) ₂	c	1386.6			
CaH ₂	c	-181.5	-142.5	41.4	41.0
CaHPO ₄ · 2H ₂ O	c	-2403.58	-2154.75	189.45	197.07
Ca(H ₂ PO ₃) ₂ hypophosphite	c	-1752.7			
Ca(H ₂ PO ₄) ₂ std. state	aq	-3135.41	-2814.33	127.6	

TABLE 6.3 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of the Elements and Inorganic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ · mol ⁻¹	$\Delta_f G^\circ$ kJ · mol ⁻¹	S° J · deg ⁻¹ · mol ⁻¹	C_p° J · deg ⁻¹ · mol ⁻¹
Ca(H ₂ PO ₄) ₂ · H ₂ O	c	-3409.67	-3058.42	259.8	258.82
CaI ₂	c	-533.5	-528.9	142.0	77.16
std. state	aq	-653.2	-656.7	169.5	
Ca(IO ₃) ₂	c	-1002.5	-839.3	230	
Ca[Mg(CO ₃) ₂] dolomite	c	-2326.3	-2163.6	155.18	157.53
CaMoO ₄	c	-1541.4	-1434.7	122.6	114.3
Ca ₃ N ₂	c	-439.3		105.0	113.0
Ca(NO ₂) ₂	c	-741.4			
Ca(NO ₃) ₂	c	-938.2	-742.8	193.3	149.37
std. state	aq	-957.55	-776.22	239.7	
CaO	c	-634.92(90)	-603.3	38.1(4)	42.0
Ca(OH) ₂	c	-985.2	-897.5	83.4	87.5
Ca ₃ P ₂	c	-506			
Ca ₃ (PO ₄) ₂	c	-4120.8	-3884.8	236.0	227.8
Ca ₂ P ₂ O ₇	c	-3338.8	-3132.1	189.24	187.8
Ca ₁₀ (PO ₄) ₆ F ₂ fluoroapatite	c	-13,744	-12,983	775.7	751.9
CaS	c	-482.4	-477.4	56.5	47.4
CaSe	c	-368.2	-363.2	67	
CaSiO ₃	c	-1634.9	-1549.7	81.92	85.27
Ca ₂ SiO ₄	c	-2307.5	-2192.8	127.7	128.8
3CaO · SiO ₂	c	-2929.2	-2784.0	168.6	171.9
CaSO ₃ · 2H ₂ O	c	-1752.7	-1555.2	184	178.7
CaSO ₄	c	-1425.2	-1309.1	108.4	99.0
	aq	-1451.1	-1298.1	-33.1	
CaSO ₄ · ½H ₂ O	c	-1576.7	-1436.8	130.5	119.4
CaSO ₄ · 2H ₂ O	c	-2022.6	-1797.5	194.1	186.0
Ca(VO ₃) ₂	c	-2329.3	-2169.7	179.1	166.8
CaWO ₄	c	-1645.15	-1538.50	126.40	114.14
Carbon					
C graphite	c	0	0	5.74(10)	8.517
	g	716.68(45)		158.100(3)	
diamond	c	1.897	2.900	2.377	6.116
CN ⁻	aq	150.6	172.4	94.1	
(CN) ₂ cyanogen	g	306.7	297.2	241.9	56.9
CNBr	g	186.2	165.3	248.36	46.9
CNCl	g	137.95	131.02	236.2	45.0
CNF	g			224.7	41.8
CNI	c	166.2	185.0	96.2	
	g	225.5	196.6	256.8	48.3
CNN ₃ cyanogen azide	c	387.4			
OCN ⁻	aq	-146.0	-97.4	106.7	
CO	g	-110.53(17)	-137.16	197.660(4)	29.14
CO ₂	g	-393.51(13)	394.39	213.785(10)	37.13
undissoc; std. state	aq	-413.26(20)	-386.0	119.36(60)	
CO ₃ ²⁻	aq	-675.23(25)	-527.9	-50.0(10)	
C ₃ O ₂ suboxide	g	-93.7	-109.8	276.4	67.0
COBr ₂	g	-96.2	-110.9	309.1	61.8
COCl ₂ phosgene	g	-219.1	-204.9	283.50	57.70
COCIF	g			276.7	52.4
COF ₂	g	-639.8	-623.33	258.89	46.8

TABLE 6.3 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of the Elements and Inorganic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ · mol ⁻¹	$\Delta_f G^\circ$ kJ · mol ⁻¹	S° J · deg ⁻¹ · mol ⁻¹	C_p° J · deg ⁻¹ · mol ⁻¹
COS carbonyl sulfide	g	-142.0	-166.9	231.56	41.50
CS ₂	lq	89.0			74.6
	g	117.7	67.1	237.8	45.4
CTe ₂	lq	164.8			
Cerium					
Ce γ, fcc	c	0	0	72.0	26.9
Ce ³⁺ std. state	aq	-696.2	-672.0	-205.0	
Ce ⁴⁺ std. state	aq	-537.2	-503.8	-301.0	
CeCl ₃	c	-1060.5	-984.8	151.0	87.4
std. state	aq	-1197.5	-1065.7	-38.0	
CeF ₃	c	-1635.9	-1556	115.1	99.3
CeI ₃	c	-669.3	-674	209	
Ce(NO ₃) ₃	c	-1225.9			
CeO ₂	c	-1088.7	-1024.7	62.30	61.63
Ce ₂ O ₃	c	-1796.2	-1706.2	150.6	114.6
CeS	c	-459.4	-451.5	78.2	50.0
Ce ₂ (SO ₄) ₃	c	-3954.3			
std. state	aq	-4176.9	-3652.6	-318	
Ce ₂ (SO ₄) ₃ · 8H ₂ O	c	-5522.9	-5607.4		
Cesium					
Cs	c	0	0	85.23(40)	32.20
	lq	2.087	0.025	92.1	32.4
	g	76.5(10)		175.601(3)	
Cs ⁺ std. state	aq	-258.00(50)	-292.0	132.1(5)	-10.5
Cs acetate	aq	-744.3	-661.3	219.7	
CsBO ₂	c	-972.0	-915.0	104.4	80.6
CsBr	c	-405.8	-391.4	113.05	52.93
std. state	aq	-379.8	-396.0	215.5	
CsCl	c	-442.8	414.4	101.18	52.44
std. state	aq	-425.4	-423.3	189.4	-146.9
CsClO ₄	c	-443.1	-314.3	175.1	108.3
Cs ₂ CO ₃	c	-1139.7	-1054.4	204.5	123.9
std. state	aq	-1193.7	-1111.9	209.2	
CsF	c	-553.5	-525.5	92.8	51.1
std. state	aq	-590.9	-570.8	119.2	
Cs formate	aq	-683.8	-643.0	226.0	
CsHCO ₃	c	-966.1			
CsHF	c	-923.8	-858.9	135.2	87.3
CsHSO ₄	c	-1158.1			
	aq	-1145.6	-1047.9	264.8	
CsI	c	-346.6	-340.6	123.1	52.8
std. state	aq	-313.5	-343.6	244.4	-152.7
CsIO ₃	c	-525.9	-433.9		167
CsNO ₃	c	-506.0	-406.6	155.2	
std. state	aq	-465.6	-403.3	279.5	-99.2
Cs ₂ O	c	-345.8	-308.2	146.9	76.0
CsOH	c	-417.2	370.7	98.7	67.9
std. state	aq	-488.3	-449.3	122.3	
Cs ₂ PtCl ₆ std. state	aq	-1184.9	-1066.9	485.8	
Cs ₂ S	aq	-483.7	-498.3	251.0	
Cs ₂ Se	aq		454.8		

TABLE 6.3 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of the Elements and Inorganic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ · mol ⁻¹	$\Delta_f G^\circ$ kJ · mol ⁻¹	S° J · deg ⁻¹ · mol ⁻¹	C_p° J · deg ⁻¹ · mol ⁻¹
Cs ₂ SO ₄	c	-1443.0	-1323.6	211.9	134.9
std. state	aq	-1425.8	-1328.6	286.2	
Chlorine					
Cl atomic	g	121.301(8)		165.190(4)	
Cl ⁻ std. state	aq	-167.08(10)	-131.3	56.60(20)	-136.4
Cl ₂	g	0		233.08(10)	33.95
ClF	g	-50.3	-51.84	217.9	32.08
ClF ₃	g	-163.2	-123.0	281.6	63.85
ClF ₅	g	-239	-147	310.74	97.17
ClO	g	101.8	98.1	226.6	31.5
ClO ⁻ std. state	aq	-107.1	-36.8	41.8	
ClO ₂	g	102.5	120.5	256.8	42.00
ClO ₂ ⁻ std. state	aq	-66.5	17.2	101.3	
ClO ₃ ⁻ std. state	aq	-104.0	-8.0	162.3	
ClO ₃ F perchloryl fluoride	g	-23.8	48.2	279.0	64.9
ClO ₄ ⁻ std. state	aq	-128.10(40)	-8.62	184.0(15)	
Cl ₂ O	g	80.3	97.9	266.2	45.4
Cl ₂ O ₇	lq	238.1			
	g	1138			
Chromium					
Cr	c	0	0	23.8	23.43
Cr ²⁺ std. state	aq	-143.5			
CrBr ₂	c	-302.1			
CrCl ₂	c	-395.4	-356.0	115.3	71.2
CrCl ₃	c	-556.5	-486.1	123.0	91.8
Cr(CO) ₆ hexacarbonyl	c	-1077.8		293.01	226.23
CrF ₂	c	-778.0			
CrF ₃	c	-1159	-1088	93.9	78.7
Cr ₂ FeO ₄	c	-1444.7	-1343.8	146.0	133.6
CrI ₂	c	-156.9			
CrI ₃	c	-205.0			
CrN	c	-117	-93	38	52.7
CrO ₂	c	-598.0			
Cr ₂ O ₃	c	-1140	-1058.1	81.2	118.7
Cr ₃ O ₄	c	-1131.0			
CrO ₂ Cl ₂	g	-538.1	-501.6	329.8	84.5
CrO ₄ ²⁻ std. state	aq	-881.15	-727.85	50.21	
HCrO ₄ ⁻ std. state	aq	-878.22	-764.84	184.1	
Cr ₂ O ₇ ²⁻ std. state	aq	-1490.3	-1301.2	261.9	
Cr ₂ (SO ₄) ₃	c	-609.6		269.9	302.6
Cobalt					
Co	c	0	0	30.0	24.8
Co ²⁺ std. state	aq	-58.2	-54.4	-113	
Co ³⁺ std. state	aq	92	134	-305	
CoBr ₂	c	-220.9			79.5
std. state	aq	-301.3	-262.3	50	
CoCl ₂	c	-312.5	-269.8	109.2	78.49
std. state	aq	-392.5	-316.7	0	
CoCO ₃	c	-713.0			
CoF ₂	c	-692	-647	82.4	68.9
CoF ₃	c	-790	-719	95	92

TABLE 6.3 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of the Elements and Inorganic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ · mol ⁻¹	$\Delta_f G^\circ$ kJ · mol ⁻¹	S° J · deg ⁻¹ · mol ⁻¹	C_p° J · deg ⁻¹ · mol ⁻¹
CoI ₂	c	-88.7			
	aq	-168.6	-157.7	109.0	
Co(NH ₃) ₆ ²⁺ std. state	aq	-584.9	-157.3	146	
Co(NH ₃) ₆ ³⁺ std. state	aq		-189.5		
Co(NO ₃) ₂	c	-420.5			
std. state	aq	-472.8	-277.0	180	
CoO	c	-237.7	-214.0	53.0	55.3
Co ₃ O ₄	c	-891	-774	102.5	123.4
Co(OH) ₂	c	-539.7	-454.4	79.0	
CoS	c	-82.8			
Co ₂ S ₃	c	-147.3			
CoSO ₄	c	-888.3	-782.4	118.0	103
std. state	aq	-967.3	-799.1	-92.0	
CoSO ₄ · 7H ₂ O	c	-2979.93	-2473.83	406.06	390.49
Copper					
Cu	c	0	0	33.15(8)	24.44
	g	337.4(12)		166.398(4)	
Cu ⁺ std. state	aq	71.67	50.00	40.6	
Cu ²⁺ std. state	aq	64.9(10)	65.52	-98.(4)	
Cu(OAc) ₂ acetate	c	-893.3			
std. state	aq	-907.25	-673.29	73.6	
Cu ₃ (AsO ₄) ₂ std. state	aq	-1581.97	-1100.48	-804.2	
CuBr	c	-104.6	-100.8	96.2	54.7
CuBr ₂	c	-141.84			
CuCl	c	-137.2	-119.9	86.2	48.5
CuCl ₂	c	-220.1	-175.7	108.09	71.88
Cu(ClO ₄) ₂ std. state	aq	-193.89	48.28	264.4	
CuCN	c	95.0	108.4	90.00	61.04
CuCNS std. state	aq	138.11	142.67	184.93	
Cu(CNS) ₂ std. state	aq	217.65	250.87	189.1	
CuF	c	-280	-260	64.9	51.9
CuF ₂	c	-542.7	-492	77.45	65.55
Cu(formate) ₂	aq	-786.34	-636.4	84	
CuI	c	67.8	-69.5	96.7	54.1
Cu(NH ₃) ₄ ²⁺ std. state	aq	-348.5	-111.3	273.6	
Cu(NO ₃) ₂	c	-302.9			
std. state	aq	-349.95	-157.15	193.3	
CuO	c	-157.3	-129.7	42.6	42.2
Cu ₂ O	c	-168.6	-149.0	93.1	63.6
Cu(OH) ₂	c	-450	-373	108.4	95.19
CuS	c	-53.1	-53.7	66.5	47.8
Cu ₂ S	c	-79.5	-86.2	120.9	76.3
CuSe	c	-39.5			
Cu ₂ Se	c	-59.4		157.3	88.70
CuSO ₄	c	-771.4(12)	-662.2	109.2(4)	98.87
std. state	aq	-844.50	-679.11	-79.5	
CuSO ₄ · 5H ₂ O	c	-2279.65	-1880.04	300.4	280
CuWO ₄	c	-1105.0			
Dysprosium					
Dy	c	0	0	75.6	27.7
Dy ³⁺ std. state	aq	-699.0	-665.0	-231.0	21.0

TABLE 6.3 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of the Elements and Inorganic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ · mol ⁻¹	$\Delta_f G^\circ$ kJ · mol ⁻¹	S° J · deg ⁻¹ · mol ⁻¹	C_p° J · deg ⁻¹ · mol ⁻¹
DyCl ₃	c	-1000			100.0
	aq	-1197.0	-1059.0	-61.9	-389.0
DyF ₃	c	-1711.0			
Dy ₂ O ₃	c	-1863.1	-1771.5	149.8	116.27
Erbium					
Er	c	0	0	73.18	28.12
Er ³⁺ std. state	aq	-705.4	-669.1	-244.3	21.0
ErCl ₃	c	-998.7			100.0
	aq	-1207.1	-1062.7	-75.3	-389.0
Er ₂ O ₃	c	-1897.9	-1808.7	155.6	108.49
Europium					
Eu	c	0	0	77.78	27.66
Eu ²⁺ std. state	aq	-527.0	540.2	-8.0	
Eu ³⁺	aq	-605.0	-574.0	-222.0	8.0
EuCl ₂	aq	-862.0			
EuCl ₃	c	-936.0	-856	144.1	
	aq	-1106.2	-967.7	-54.0	-402.0
EuF ₃	c	-1571			
Eu ₂ O ₃ monoclinic	c	-1651.4	-1556.9	146	122.2
Eu ₃ O ₄	c	-2272.0	-2142.0	205.0	
Eu(OH) ₃	c	-1332	-1195	119.9	
Fluorine					
F atomic	g	79.38(30)	62.3	158.751(4)	22.7
F ⁻	aq	-335.35(65)	-278.8	-13.8(8)	-106.7
F ₂	g	0	0	202.791(5)	31.30
FNO ₃	g	10.5	73.7	292.9	65.22
FO	g	109.0	105.0	216.8	30.5
F ₂ O	g	24.7	41.9	247.4	43.3
F ₂ O ₂	g	18.0			
Francium					
Fr	c	0	0	95.40	31.80
FrCl	c	-439		113.0	53.56
Fr ₂ O	c	-338	299.2	156.9	
Gadolinium					
Gd	c	0	0	68.07	37.03
Gd ³⁺ std. state	aq	-686.0	-661.0	-205.9	
GdCl ₃	c	-1008.0	-933	151.4	88.0
std. state	aq	-1188.0	-1059.0	-36.8	-410.0
GdF ₃	lq	-1297			
Gd ₂ O ₃ monoclinic	c	-1819.6	-1730	150.6	106.7
Gallium					
Ga	c	0	0	40.8	26.06
	lq	5.6			
	g	272.0	233.7	169.0	25.3
Ga ³⁺	aq	-211.7	-159.0	-331.0	
GaAs	c	-71.0	-67.8	64.2	46.2
GaBr ₃	c	-386.6	-359.8	180.0	
GaCl ₃	c	-524.7	-454.8	142.0	
GaF ₃	c	-1163.0	-1085.3	84	
GaI ₃	c	-238.9		205.0	100
Ga ₂ O ₃ rhombic	c	-1089.1	-998.3	84.98	92.1

TABLE 6.3 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of the Elements and Inorganic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ · mol ⁻¹	$\Delta_f G^\circ$ kJ · mol ⁻¹	S° J · deg ⁻¹ · mol ⁻¹	C_p° J · deg ⁻¹ · mol ⁻¹
Ga(OH) ₃	c	-964.4	-831.3	100.0	
GaSb	c	-41.8	-38.9	76.07	48.53
Germanium					
Ge	c	0	0	31.09(15)	23.3
	g	372.0(30)	331.2	167.904(5)	30.7
GeBr ₄	lq	-347.7	-331.4	280.8	
	g	-300.0	-318.0	396.2	101.8
GeCl ₄	lq	-531.8	-462.8	245.6	
	g	-495.8	-457.3	347.7	96.1
GeF ₄	g	-1190.20(50)	-1150.0	301.9(10)	81.84
GeH ₄	g	90.8	113.4	217.02	45.02
GeI ₄	c	-141.8	-144.4	271.1	
	g	-56.9	-106.3	428.9	104.1
GeO ₂ tetragonal	c	-580.0(10)	-521.4	39.71(15)	52.1
GeP	c	-21.0	-17.0	63.0	
GeS	c	-69.0	-71.6	71	
Gold					
Au	c	0	0	47.4	25.36
AuBr	c	-14.0			
AuBr ₃	c	-53.3			
AuCl	c	-34.7		92.9	48.74
AuCl ₃	c	-117.6		148.1	94.81
AuCl ₃ ⁻ std. state	aq	-322.2	-237.32	266.9	
Au(CN) ₂ ⁻ std. state	aq	242.3	285.8	172	
AuF ₃	c	-363.6		114.2	91.29
AuSb ₂	c	-19.46		119.2	77.40
AuSn	c	-30.5		93.7	49.41
Hafnium					
Hf hexagonal	c	0	0	43.56	25.69
HfC	c	-230.1		41.21	34.43
HfCl ₄	c	-990.4	-901.3	190.8	120.46
HfF ₄ monoclinic	c	-1930.5	-1830.5	113	
HfO ₂	c	-1144.7	-1088.2	59.3	60.25
Helium					
He	g	0	0	126.153(2)	20.786
Holmium					
Ho	c	0	0	75.3	27.15
Ho ³⁺ std. state	aq	-705.0	-673.7	226.8	17.0
HoCl ₃	c	-1005.4			88
std. state	aq	-1206.7	-1067.3	-57.7	-393.0
HoF ₃	c	-1707.0			
Ho ₂ O ₃	c	-1880.7	-1791.2	158.2	115.0
Hydrogen					
H atomic	g	217.998(6)	203.3	114.717(2)	20.8
H ⁺ std. state	aq	0	0	0	0
H ₂	g	0	0	130.680(3)	28.84
H ² H	g	0.321	-1.463	143.80	29.20
² H ₂ (D ₂) deuterium	g	0	0	144.96	29.19
HAsO ₂ ⁻ undissoc; std. state	aq	-456.5	-402.71	125.9	

TABLE 6.3 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of the Elements and Inorganic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ · mol ⁻¹	$\Delta_f G^\circ$ kJ · mol ⁻¹	S° J · deg ⁻¹ · mol ⁻¹	C_p° J · deg ⁻¹ · mol ⁻¹
H ₂ AsO ₃ ⁻ undissoc; std. state	aq	-714.79	-587.22	110.5	
H ₃ AsO ₃ undissoc; std. state	aq	-742.2	-639.90	195.0	
HAsO ₂ ²⁻ undissoc; std. state	aq	-906.34	-714.70	-1.7	
H ₂ AsO ₄ ⁻ undissoc; std. state	aq	-909.56	-753.29	117	
H ₃ AsO ₃ undissoc; std. state	c	-906.30			
HBO ₂	c	-794.3	-723.4	38	54.4
H ₃ BO ₃ undissoc	c	-1094.8(8)	-968.9	89.95(60)	86.1
HBr	g	-36.29(16)	-53.4	198.700(4)	29.1
std. state	aq	-121.55	-103.97	82.4	-141.8
HBrO undissoc; std. state	aq	-113.0	-82.4	142	
HBrO ₃ std. state	aq	-67.07	18.54	161.71	
HCl	g	-92.31(10)	-95.30	186.902(5)	29.12
std. state	aq	-167.15	-131.25	56.5	-136.4
² HCl deuterium chloride	g	-93.35	-95.94	192.63	29.17
HCIO	g	-78.7	-66.1	236.7	37.15
undissoc; std. state	aq	-120.9	-79.9	142	
HCIO ₂ undissoc; std. state	aq	-51.9	5.9	188.3	
HCIO ₃ std. state	aq	-103.97	-8.03	162.3	
HCIO ₄ std. state	lq	-40.58			
std. state	aq	-129.33	-8.62	182.0	
HCIO ₄ · H ₂ O	c	-302.21			
HCIO ₄ · 2H ₂ O	lq	-677.98			
HCN	lq	108.87	124.93	112.84	70.63
ionized; std. state	g	135.1	124.7	201.81	35.86
undissoc; std. state	aq	150.6	172.4	94.1	
HCNO ionized; std. state	aq	107.11	119.66	124.7	
undissoc; std. state	aq	-146.0	-97.5	106.7	
HCNS ionized; std. state	aq	-154.39	-117.2	144.8	
HCOO ⁻ formate	aq	76.44	92.68	144.4	-40.2
CH ₃ COO ⁻ acetate	aq	-425.6	-351.0	92.0	-87.9
HCO ₃ ⁻ std. state	aq	-486.0	-369.3	86.6	-6.3
H ₂ CO ₃ std. state	aq	-689.93(20)	-586.85	98.4(5)	
HC ₂ O ₄	aq	-699.65	-623.16	187.4	
H ₂ C ₂ O ₄	aq	-818.4	-698.3	149.4	
C ₂ O ₄ ²⁻	c	-821.7	-723.7	109.8	91.0
H ₂ CS ₃ trithiocarbonic acid	aq	-825.1	-673.9	45.6	
HF	lq	25.1	27.82	233.0	149.8
undissoc; std. state	g	-273.30(70)	-275.4	173.779(3)	29.14
F ⁻	lq	-299.78	75.40	51.67	
² HF	aq	-320.08	-296.86	88.7	
HF ₂ ⁻ std. state	aq	-332.63	-278.8	-13.8	-106.7
H ₂ F ₂ dimer	g	-275.5	-277.27	179.70	29.14
H ₂ Fe(CN) ₆ ²⁻ std. state	aq	-649.94	-578.15	92.5	
	g	-572.66	-544.51	238	44.89
	aq	455.6	658.44	218	

TABLE 6.3 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of the Elements and Inorganic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ · mol ⁻¹	$\Delta_f G^\circ$ kJ · mol ⁻¹	S° J · deg ⁻¹ · mol ⁻¹	C_p° J · deg ⁻¹ · mol ⁻¹
HFO	g	98	-86	226.8	35.93
HI	g	26.50(10)	1.7	206.590(4)	29.16
std. state	aq	-55.19	-51.59	111.3	-142.3
HIO undissoc; std. state	aq	-138.1	-99.2	95.4	
HIO ₃	c	-230.1			
H ₂ MoO ₄	c	-1046.0			
HN	g	351.5	345.6	181.2	29.2
HN ₃	lq	264.0	327.2	140.6	
	g	294.1	328.1	239.0	43.7
H ₂ N	g	184.9	194.6	195.0	33.9
² H ₂ N ₂ <i>cis</i> -diazine	g	207	241	224.09	39.02
HNCO isocyanic acid	g	-116.73	-107.36	238.11	44.85
HNCS isothiocyanic acid	g	127.61	112.88	248.03	46.40
HNO ₂	g	-79.5	-46.0	254.1	45.5
HNO ₃	lq	-174.1	-80.7	155.60	109.9
	g	-133.9	-73.54	266.9	54.1
std. state	aq	-207.36	-111.34	146.4	-86.6
H ₂ N ₂ O ₂ hyponitrous acid	aq	-57.3	36.0	218	
HO hydroxyl	g	39.0	34.2	183.64	30.00
HO ⁻	aq	-230.015	-157.28	-10.90	-148.5
HO ₂	g	10.5	22.6	229.0	34.9
HO ₂ ⁻ std. state	aq	-160.33	67.4	23.9	
H ₂ O	c	-292.72			37.11
	lq	-285.830(40)	-237.14	69.95(3)	75.35
	g	-241.826(40)	-228.61	188.835(10)	33.60
¹ H ² HO	g	-245.37	-233.18	199.51	33.79
² H ₂ O deuterium oxide	g	-249.20	-234.54	198.33	34.25
H ₂ O ₂ hydrogen peroxide	lq	-187.78	-120.42	109.6	89.1
	g	-136.3	-105.6	232.7	43.14
undissoc; std. state	aq	-191.17	-134.10	143.9	
HOCN undissoc; std. state	aq	-154.39	-117.2	144.8	
OCN ⁻ cyanate std. state	aq	-146.02	-97.5	106.7	
HPO ₃	c	-948.51			
HPO ₄ ³⁻ std. state	aq	-1299.0(15)	-1089.26	-33.5(15)	
H ₂ PO ₄ ⁻ std. state	aq	-1302.6(15)	-1130.39	92.5(15)	
HPH ₂ O ₂ hypophosphorous acid	c	-604.6			
H ₃ PO ₃	c	-964.4			
H ₃ PO ₄	c	-1284.4	-1124.3	110.5	106.1
	lq	-1271.7	-1123.6	150.8	145.06
ionized; std. state	aq	-1277.4	-1018.8	222	
undissoc; std. state	aq	-1288.34	-1142.65	158.2	
HP ₂ O ₃ ³⁻	aq	-2274.8	-1972.2	46.0	
H ₂ P ₂₇ ³⁻	aq	-2278.6	-2010.2	163.0	
H ₄ P ₂ O ₇	c	-2241.0			
undissoc; std. state	aq	-2268.6	-2032.2	268	
HReO ₄	c	-762.3	-656.4	158.2	
HS	g	142.7	113.3	195.7	32.3
HS ⁻ std. state	aq	-16.3(15)	12.05	67.(5)	
H ₂ S	g	-20.6(5)	-33.4	205.81(5)	34.19
undissoc; std. state	aq	-38.6(15)	-27.87	126.(5)	

TABLE 6.3 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of the Elements and Inorganic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ · mol ⁻¹	$\Delta_f G^\circ$ kJ · mol ⁻¹	S° J · deg ⁻¹ · mol ⁻¹	C_p° J · deg ⁻¹ · mol ⁻¹
² H ₂ S	g	-23.9	-35.3	215.3	35.76
H ₂ S ₂	g	15.5			51.5
HSbO ₂ undissoc; std. state	aq	-487.9	-407.5	46.6	
HSCN undissoc; std. state	aq	76.4	97.7	144.3	-40.2
SCN ⁻ std. state	aq	76.44	92.68	144.5	-40.2
HSe ⁻ std. state	aq	15.9	43.9	79.0	
H ₂ Se	g	29.7	15.9	219.0	34.7
HSeO ₃ ⁻ std. state	aq	-514.55	-411.54	135.1	
H ₂ SeO ₃	c	-524.46			
undissoc; std. state	aq	-507.48	-426.22	207.9	
HSeO ₄ ⁻ std. state	aq	-581.6	-452.3	149.4	
H ₂ SeO ₄	c	-530.1			
H ₂ SiO ₃	c	-1188.67	-1092.4	134.0	
undissoc; std. state	aq	-1182.8	-1079.5	109	
H ₄ SiO ₄	c	-1481.1	-1333.0	192	
undissoc; std. state	aq	-1468.6	-1316.7	180	
HSO ₃ ⁻ std. state	aq	-626.22	-527.8	139.8	
HSO ₄ ⁻	aq	-886.9(10)	-755.9	131.7(30)	-84.0
HSO ₃ Cl	lq	-601.2			
HSO ₃ F	lq	-795.0			
	g	-753	-691	297	75.24
H ₂ SO ₃ undissoc; std. state	aq	-608.81	-537.90	232.2	
H ₂ SO ₄	lq	-814.0	-689.9	156.90	138.9
std. state	aq	-909.27	-744.63	20.1	293
H ₂ SO ₄ · H ₂ O	lq	-1127.6	-950.3	211.5	214.3
H ₂ SO ₄ · 2H ₂ O	lq	-1427.1	-1199.6	276.4	261.5
H ₂ SO ₄ · 3H ₂ O	lq	-1720.4	-1443.9	345.4	319.1
H ₂ SO ₄ · 4H ₂ O	lq	-2011.2	-1685.8	414.5	386.4
H ₂ S ₂ O ₇	c	-1273.6			
H ₂ Te	g	99.6		228.9	35.56
H ₂ WO ₄	c	-1131.8	-1003.9	145	113
Indium					
In	c	0	0	57.8	26.7
In ³⁺	aq	-105.0	-98.0	-151.0	
InAs	c	-58.6	-53.6	75.7	47.78
InBr ₃	c	-428.9			
InCl ₃	c	-537.2			
InF	g	-203.4			
InH	g	215.5	190.3	207.53	29.58
InI	c	-116.3	-120.5	130.0	
InI ₃	c	-238.0			
InOH ²⁺	aq	-370.3	-313.0	-88.0	
In(OH) ₂ ⁺	aq	-619.0	-525.0	25.0	
In ₂ O ₃	c	-925.27	-830.73	104.2	92
InP	c	-88.7	-77.0	59.8	45.44
InS	c	-138.1	-131.8	67	
In ₂ S ₃	c	-427	-412.5	163.6	118.0
In ₂ Se ₃	c	-343			
InSb	c	-30.5	-25.5	86.2	49.5
Iodine					
I atomic	g	106.76(4)	70.2	180.787(4)	20.8

TABLE 6.3 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of the Elements and Inorganic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ · mol ⁻¹	$\Delta_f G^\circ$ kJ · mol ⁻¹	S° J · deg ⁻¹ · mol ⁻¹	C_p° J · deg ⁻¹ · mol ⁻¹
I ⁻ std. state	aq	-56.78(5)	-51.59	106.45(30)	-142.3
I ₂	c	0	0	116.14(30)	54.44
	g	62.42(8)	19.37	260.687(5)	36.86
std. state	aq	22.6	16.40	137.2	
I ₃ ⁻ std. state	aq	-51.5	-51.5	239.3	
IBr	c	-10.5			
	g	40.8	3.7	258.8	36.4
ICl	c	-35.4	-14.05	97.93	55.23
	lq	-23.93	-13.6	135.1	
	g	17.8	-5.5	247.6	35.6
ICl ₃	c	-89.5	-22.34	167.4	
IF	g	-95.7	-118.5	236.3	33.4
IF ₅	lq	-864.8			
	g	-822.5	-751.5	327.7	99.2
IF ₇	g	-961.1	-835.8	347.7	134.5
IO	g	175.1	149.8	245.5	32.9
IO ⁻ std. state	aq	-107.5	-38.5	-5.4	
IO ₃ ⁻ std. state	aq	-221.3	-128.0	118.4	
IO ₄ ⁻ std. state	aq	-151.5	-58.6	222	
I ₂ O ₅	c	-158.07			
Iridium					
Ir	c	0	0	35.48	25.06
IrCl ₃	c	-245.6	180	113	
IrF ₆	c	-579.65	-461.66	247.7	
IrO ₂	c	-274.1		57.3	57.32
IrS ₂	c	-138.0			
Iron					
Fe alpha	c	0	0	27.32	25.09
Fe ²⁺ std. state	aq	-89.1	-78.87	-137.7	
Fe ³⁺ std. state	aq	-48.5	-4.7	-315.9	
FeBr ₂	c	-249.8	-238.1	140.7	80.2
std. state	aq	-332.2	-286.81	27.2	
FeBr ₃	c	-286.2			
	aq	-413.4	-316.7	-68.6	
Fe ₃ C α-cementite	c	25.1	20.1	104.6	105.9
FeCl ₂	c	-341.8	-302.3	118.0	76.7
	aq	-423.4	-341.3	-24.7	
FeCl ₃	c	-399.4	-333.9	142.34	96.65
std. state	aq	-550.2	-398.3	-146.4	
Fe(CN) ₆ ³⁻ std. state	aq	561.9	729.3	270.3	
Fe(CN) ₆ ⁴⁻ std. state	aq	455.6	694.9	95.0	
FeCNS ²⁺ std. state	aq	23.4	71.1	-130	
FeCO ₃	c	-740.6	-666.7	92.9	82.1
Fe(CO) ₅	lq	-774.0	-705.3	338.1	240.6
FeCr ₂ O ₄	c	-1446.0	-1343.9	146.2	133.8
FeF ₂	c	-711.3	-668.6	86.99	68.12
std. state	aq	-754.4	-636.5	-165.3	
FeF ₃	c	-1042	-972	98	91.0
	aq	-1046.4	-840.9	-357.3	
FeI ₂	c	-113.0	-111.7	167.4	83.7
std. state	aq	-199.6	-182.1	84.9	

TABLE 6.3 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of the Elements and Inorganic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ · mol ⁻¹	$\Delta_f G^\circ$ kJ · mol ⁻¹	S° J · deg ⁻¹ · mol ⁻¹	C_p° J · deg ⁻¹ · mol ⁻¹
FeI ₃	aq	-214.2	-159.4	18.0	
FeMoO ₄	c	-1075.0	-975.0	129.3	118.5
Fe ₂ N	c	-3.8		101.3	70.0
Fe(NO ₃) ₃ std. state	aq	-670.7	-338.5	123.4	
FeO	c	-272.0	-251.4	60.75	49.91
Fe ₂ O ₃ hematite	c	-824.2	-742.2	87.40	103.9
Fe ₃ O ₄ magnetite	c	-1118.4	-1015.4	145.27	143.4
FeOH ⁺ std. state	aq	-324.7	-277.4	-29	
Fe(OH) ²⁺ std. state	aq	-290.8	-229.4	-142	
Fe(OH) ₂	c	-574.0	-490.0	87.9	97.1
Fe(OH) ₃	c	-833	-705	104.6	101.7
FeS	c	-100.0	-100.4	60.32	50.52
FeS ₂ marcasite	c	-167.4	-156.1	53.87	62.39
FeS ₂ pyrite	c	-178.2	-166.9	52.92	62.12
FeSiO ₃	c	-1155		87.5	89.4
Fe ₂ SiO ₄	c	-1479.9	-1379.0	145.18	132.9
FeSO ₄	c	-928.4	-820.8	107.5	100.6
std. state	aq	-998.3	-823.4	-117.6	
Fe ₂ (SO ₄) ₃	c	-2583.0	-2262.7	307.5	264.8
std. state	aq	-2825.0	-2243.0	-571.5	
FeTiO ₃	c	-1246.4		105.9	99.5
FeWO ₄	c	-1155.0	-1054.0	131.8	114.4
Krypton					
Kr	g	0	0	164.085(3)	20.786
Lanthanum					
La	c	0	0	56.9	27.11
La ³⁺	aq	-707.1	683.7	-217.6	-13.0
LaCl ₃	c	-1072.2		144.4	108.8
std. state	aq	-1208.8	-1077.4	-50.0	-423.0
LaCl ₃ · 7H ₂ O	c	-3178.6	-2713.3	462.8	431.0
LaI ₃	c	-668.9			
La(NO ₃) ₃	c	-1254.4			
std. state	aq	-1329.3			
La ₂ O ₃	c	-1793.7	-1705.8	127.32	108.78
La ₂ (SO ₄) ₃	c	-3941.3		280	
La ₂ Te ₃	c	-724	-714.6	231.63	132.13
Lead					
Pb	c	0	0	64.80(30)	26.84
	g	195.2(8)	162.2	175.375(5)	20.8
Pb ²⁺	aq	0.92(25)	-24.4	18.5(10)	
Pb(OAc) ₂	c	-964.4			
Pb(BO ₂) ₂	c	-1556	-1450	131	107.1
PbB ₄ O ₇	c	-2858	-2667	167	168
PbBr ₂	c	-278.7	-261.9	161.5	80.1
	aq	-244.8	-232.3	175.3	
Pb(CH ₃) ₄	lq	97.9			
Pb(C ₂ H ₅) ₄	lq	52.7		464.6	307.4
PbCl ₂	c	-359.4	-314.1	136	77.1
	aq	-336.0	-286.9	123.4	
PbCl ₄	lq	-329.3			
PbClF	c	-534.7	-488.3	121.8	

TABLE 6.3 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of the Elements and Inorganic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ · mol ⁻¹	$\Delta_f G^\circ$ kJ · mol ⁻¹	S° J · deg ⁻¹ · mol ⁻¹	C_p° J · deg ⁻¹ · mol ⁻¹
PbCO ₃	c	-699.2	-625.5	131.0	87.40
PbC ₂ O ₄	c	-851.4	-750.2	146.0	105.4
PbCrO ₄	c	-930.9			
PbF ₂	c	-664	-617.1	110.5	72.3
	aq	-666.9	-582.0	-17.2	
PbF ₄	c	-941.8			
PbI ₂	c	-175.5	-173.58	174.9	77.4
	aq	-112.1	-127.6	233.0	
PbMoO ₄	c	-1051.9	-951.4	166.1	119.70
Pb(N ₃) ₂ monoclinic	c	478.2	624.7	148.1	
Pb(NO ₃) ₂	c	-451.9			
	aq	-416.3	-246.9	303.3	
PbO litharge	c	-219.0	-188.9	66.5	45.8
PbO ₂	c	-277.4	-217.3	68.60	64.6
Pb ₃ O ₄	c	-718.4	-601.2	211.3	146.9
Pb ₃ (PO ₄) ₂	c	-2595.3	-2432.6	353.1	256.3
PbS	c	-100.4	-98.7	91.3	49.4
PbSe	c	-102.9	-101.7	102.5	50.2
PbSeO ₄	c	-609.2	505.0	167.8	
PbSiO ₃	c	-1145.7	-1062.1	109.6	90.04
PbSiO ₄	c	-2023.8	-1909.6	84.01	98.66
Pb ₂ SiO ₄	c	-1363.1	-1252.6	186.6	137.2
PbSO ₃	c	-669.9			
PbSO ₄	c	-919.97(40)	-813.0	148.50(60)	103.2
PbSO ₄ · PbO	c	-1182.0		225.06	150.16
PbTe	c	-70.7	-69.5	110.0	50.5
Lithium					
Li	c	0	0	29.12(20)	24.8
	g	159.3(10)		138.782(10)	
Li ⁺ std. state	aq	-278.47(8)	-293.30	12.24(15)	68.6
Li ₃ AlF ₆ cryolite	c	-3317	-3152	238.5	215.7
LiAlH ₄	c	-116.3	-44.7	78.7	83.2
LiAlO ₂	c	-1188.7	-1126.3	53.3	67.78
LiBeF ₃	c	-1651.8	-1576.3	89.2	91.8
LiBH ₄	c	-190.8	-125.0	75.9	82.6
LiBH ₄ · tetrahydrofuran	c	-415.5	-220.5	289	
Li ₂ BeF ₄	c	-2274	-2171	130.6	135.3
LiBO ₂	c	-1032.2	-976.1	51.5	59.8
Li ₂ B ₄ O ₇	c	-3362	-3170	156	183.0
LiBr	c	-351.2	-342.00	74.27	48.91
std. state	aq	-400.03	-397.27	95.81	-73.2
LiBrO ₃	c	-346.98			
std. state	aq	-345.56	-274.89	174.9	
LiCl	c	-408.6	-384.4	59.3	48.03
	aq	-445.6	-424.6	69.9	-67.8
LiClO ₄	c	-381.0	-254	126	105
std. state	aq	-407.81	-302.1	195.4	-7.5
Li ₂ CO ₃	c	-1215.9	-1132.12	90.4	99.1
	aq	-1234.1	-1114.6	-29.7	
LiF	c	-616.0	-587.7	35.66	41.6
std. state	aq	-611.12	-571.9	-0.4	-38.1

TABLE 6.3 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of the Elements and Inorganic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ · mol ⁻¹	$\Delta_f G^\circ$ kJ · mol ⁻¹	S° J · deg ⁻¹ · mol ⁻¹	C_p° J · deg ⁻¹ · mol ⁻¹
LiH	c	-90.5	-68.45	20.04	27.96
LiI	c	-270.4	-270.3	86.8	51.0
std. state	aq	-333.67	-344.8	124.7	-73.6
LiIO ₃	c	-503.38			
std. state	aq	-499.82	-421.33	131.4	-55.2
Li ₃ N	c	-164.6	-128.6	62.59	75.27
LiNO ₂	c	-372.4	-302.0	96.0	
LiNO ₃	c	-483.1	-381.1	90.0	
std. state	aq	-485.9	-404.5	160.2	-18.0
Li ₂ O	c	-597.9	-561.2	37.6	
Li ₂ O ₂	c	-634.3	-578.9	56.5	70.6
LiOH	c	-484.9	-439	42.82	49.7
std. state	aq	-508.40	-451.9	7.1	
Li ₃ PO ₄	c	-2095.8			
Li ₂ SiO ₃	c	-1648.1	-1557.2	79.8	99.1
Li ₂ Si ₂ O ₅	c	-2561	-2417	125.5	138.1
Li ₂ SO ₄	c	-1436.4	-1321.7	115.1	117.6
std. state	aq	-1466.2	-1331.2	7.3	-155.6
Li ₂ TiO ₃	c	-1670.7	-1579.8	91.8	109.9
Lutetium					
Lu	c	0	0	50.96	26.86
Lu ³⁺	aq	-665.0	-628.0	-264.0	25.0
LuCl ₃	c	-945.6			
std. state	aq	-1167.0	-1021.0	-96.0	-385.0
LuI ₃	c	-548.0			
Lu ₂ O ₃	c	-1878.2	-1789.1	109.96	101.75
Magnesium					
Mg	c	0	0	32.67(10)	24.87
	g	147.1(8)		148.648(3)	
Mg ²⁺ std. state	aq	-467.0(6)	-454.8	-137.(4)	
MgAl ₂ O ₄	c	-2299	-2177	89.0	116.20
MgBr ₂	c	-524.3	-503.8	117.2	73.16
std. state	aq	-709.94	-662.8	26.8	
MgBr ₂ · 6H ₂ O	c	-2410.0	-2056.0	397	
MgCl ₂	c	-641.3	-591.8	89.63	71.38
std. state	aq	-801.15	-717.1	-25.1	
MgCl ₂ · 6H ₂ O	c	-2499.0	-2115.0	315.1	
Mg(ClO ₄) ₂	c	-568.90			
std. state	aq	-725.51	-472.0	225.4	
Mg(ClO ₄) ₂ · 6H ₂ O	c	-2445.6	-1863.1	520.1	
MgCO ₃	c	-1095.8	-1012.1	65.7	75.51
MgC ₂ O ₄	c	-1269.0			
std. state	aq	-1292.0	-1128.8	-92.5	
MgF ₂	c	-1124.2(12)	1071.1	57.2(5)	61.5
Mg ₂ Ge	c	-108.8	-105.9	86.48	69.54
MgH ₂	c	-75.3	-35.9	31.1	35.4
MgI ₂	c	-364.0	-358.2	129.7	74.8
std. state	aq	-577.22	-558.1	84.5	
Mg ₃ N ₂	c	-461.1	-400.9	87.9	104.5
MgNH ₄ PO ₄ · 6H ₂ O	c	-3681.9			
Mg(NO ₃) ₂	c	-790.65	-589.5	164.0	141.9
std. state	aq	-881.6	-677.4	154.8	

TABLE 6.3 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of the Elements and Inorganic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ · mol ⁻¹	$\Delta_f G^\circ$ kJ · mol ⁻¹	S° J · deg ⁻¹ · mol ⁻¹	C_p° J · deg ⁻¹ · mol ⁻¹
Mg(NO ₃) ₂ · 6H ₂ O	c	-2613.3	-2080.7	452	
MgO microcrystal	c	-601.6(3)	-569.3	26.95(15)	37.2
Mg(OH) ₂	c	-924.7	-833.7	63.24	77.25
std. state	aq	-926.8	-769.4	-149.0	
Mg ₃ (PO ₄) ₂	c	-3780.7	-3538.8	189.20	213.47
MgS	c	-346.0	-341.8	50.3	45.6
MgSeO ₄	c	-968.51			
std. state	aq	-1066.1	-896.2	-84.1	
Mg ₂ Si	c	-77.8	-77.1	81.6	67.9
MgSiO ₃ clinoenstatite	c	-1548.9	-1462.0	67.8	81.9
Mg ₂ SiO ₄ forsterite	c	-2174.0	-2055.1	95.1	118.5
Mg ₃ Si ₄ O ₁₀ (OH) ₂ talc	c	-5922.5	-5543.0	260.7	321.8
MgSO ₃ · 3H ₂ O	c	-1931.8			
MgSO ₃ · 6H ₂ O	c	-2817.5			
MgSO ₄	c	-1284.9	-1170.6	91.6	96.5
std. state	aq	-1376.1	-1199.5	-118.01	
MgSO ₄ · H ₂ O kieserite	c	-1602.1	-1428.8	126.4	
MgSO ₄ · 7H ₂ O epsomite	c	-3388.71	-2871.9	372	
MgTiO ₃	c	-1497.6	-1420.1	111.08	91.88
Mg ₂ TiO ₄	c	-2164.0	-2048	115.0	129
MgTi ₂ O ₅	c	-2509	-2369	135.6	146.9
Mg ₂ V ₂ O ₇ triclinic	c	-2835.9	-2645.29	200.4	203.47
MgWO ₄	c	-1516	-1404	101.2	109.1
Manganese					
Mn	c	0	0	32.01	26.30
Mn ²⁺ std. state	aq	-220.75	-228.1	-73.6	50
MnBr ₂	c	-384.9	-372	138.1	75.31
std. state	aq	-464.0	-409.2		
Mn ₃ C	c	-4.6	5.4	98.7	93.51
MnCl ₂	c	-481.3	-440.5	118.20	72.9
std. state	aq	-555.05	-490.8	38.9	-222
MnCO ₃	c	-894.1	-816.7	85.8	81.5
Mn ₂ (CO) ₁₀	c	-1677.4			
MnF ₂	c	-795.0	-749	92.26	67.99
MnI ₂	c	-242.7		150.6	75.35
	aq	-331.0			
Mn(NO ₃) ₂	c	-576.26			
std. state	aq	-635.6	-451.0	218.0	-121.0
MnO	c	-385.2	-362.9	59.8	45.4
MnO ₂	c	-520.1	-465.2	53.1	54.1
Mn ₂ O ₃	c	-959.0	-881.2	110.5	107.7
MnO ₄ ⁻	aq	-541.4	-447.3	191.2	-82.0
MnO ₃ ²⁻	aq	-653.0	-500.8	59	
Mn ₃ O ₄	c	-1387.8	-1283.2	155.6	139.7
Mn ₃ (PO ₄) ₂	c	-3116.7			
MnS	c	-214.2	-218.4	78.2	50.0
MnSe	c	-106.7	-111.7	90.8	51.0
MnSiO ₃	c	-1320.9	-1240.6	89.1	86.4
MnSiO ₄	c	-1730.5	-1632.1	163.2	129.9
MnSO ₄	c	-1065.3	-957.42	112.1	100.4
std. state	aq	-1130.1	-972.8	-53.6	-243
MnTiO ₃	c	-1355.6		105.9	99.8

TABLE 6.3 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of the Elements and Inorganic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ · mol ⁻¹	$\Delta_f G^\circ$ kJ · mol ⁻¹	S° J · deg ⁻¹ · mol ⁻¹	C_p° J · deg ⁻¹ · mol ⁻¹
Mercury					
Hg	lq	0	0	75.90(12)	28.00
	g	61.38(4)	31.8	174.971(5)	20.8
Hg ²⁺	aq	170.21(20)		-36.19(80)	
Hg ⁺	aq	166.87(50)		65.74(80)	
HgBr ₂	c	-170.7	-153.1	172.0	75.3
Hg ₂ Br ₂	c	-206.9	-181.1	218.0	104.6
Hg(CH ₃) ₂	lq	59.8	140.2	209	
Hg(C ₂ H ₅) ₂	lq	30.1			
HgCl ₂	c	-224.3	-178.6	146.0	73.9
Hg ₂ Cl ₂	c	-265.37(40)	-210.7	191.6(8)	102.0
Hg(CN) ₂	c	263.6			
Hg ₂ CO ₃	c	-553.5	-468.1	180.0	
HgC ₂ O ₄	c	-678.2			
HgF ₂	c	-405	-362	134.3	74.86
Hg ₂ F ₂	c	-485	-469	161	100.4
HgI ₂	c	-105.4	-101.7	180.0	77.75
Hg ₂ I ₂	c	-121.3	-111.1	233.5	105.9
Hg ₃ (N ₃) ₂	c	594.1	746.4	205	
HgO	c	-90.79(12)	-58.49	70.25(30)	44.06
HgS	c	-58.2	-50.6	82.4	48.4
HgSO ₄	c	-707.5	-594		
Hg ₂ SO ₄	c	-743.09(40)	-625.8	200.70(20)	131.96
HgTe	c	-42.0			
Molybdenum					
Mo	c	0	0	28.71	24.13
MoBr ₃	c	-284	-259	175	105.4
MoCl ₄	c	-477	-402	224	128
MoCl ₅	c	-527	-423	238	155.6
MoCl ₆	c	-523	-391	255	175
Mo(CO) ₆	c	-982.8	-877.8	325.9	242.3
MoF ₆	lq	-1585.66	-1473.17	259.69	169.8
MoO ₂	c	-588.9	-533.0	46.3	56.0
MoO ₃	c	-745.2	-668.1	77.8	75.0
MoO ₄ ²⁻ std. state	aq	-997.9	-836.4	27.2	
MoS ₂	c	-235.1	-225.9	62.57	63.56
Mo ₂ S ₃	c	-270.3	-278.6	181.2	109.3
Neodymium					
Nd	c	0	0	71.6	27.5
Nd ³⁺ std. state	aq	-696.2	-671.5	-206.7	-21
NdCl ₃	c	-1041.0			113
std. state	aq	-1197.9	-1065.7	-37.7	-431
NdF ₃	c	-1657.0			
Nd(NO ₃) ₃	c	-1230.9			
Nd ₂ O ₃	c	-1807.9	-1720.9	158.6	111.3
Neon					
Ne	g	0	0	146.328(3)	20.786
Neptunium					
Np	c	0	0		29.46
NpF ₆	c	-1937			
NpO ₂	c	-1029	-979	80.3	66.1

TABLE 6.3 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of the Elements and Inorganic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ · mol ⁻¹	$\Delta_f G^\circ$ kJ · mol ⁻¹	S° J · deg ⁻¹ · mol ⁻¹	C_p° J · deg ⁻¹ · mol ⁻¹
Nickel					
Ni	c	0	0	29.87	26.1
Ni ²⁺ std. state	aq	-54.0	-45.6	-128.9	
Ni(OAc) ₂ std. state	aq	-1025.9	-784.5	44.4	
NiBr ₂	c	-212.1			
	aq	-297.1	-253.6	36.0	
NiCl ₂	c	-305.3	-259.0	97.7	71.66
std. state	aq	-388.3	-307.9	-15.1	
Ni(CN) ₄ ²⁻ std. state	aq	367.8	472.0	218	
Ni(CO) ₄	lq	-633.0	-588.2	313	404.6
	g	-602.9	-587.2	410.6	145.2
NiC ₂ O ₄	c	-856.9			
NiF ₂	c	-651.5	-604.2	73.6	64.1
	aq	-719.2	-603.3	-156.5	
NiI ₂	c	-78.8			
	aq	-164.4	-149.0	93.7	
Ni(NO ₃) ₂	c	-415.1			
std. state	aq	-468.6	-268.6	164.0	
NiO	c	-240.6	-211.7	38.00	44.31
Ni ₂ O ₃	c	-489.5			
NiOH ⁺	aq	-287.9	-227.6	-71.0	
Ni(OH) ₂	c	-529.7	-447.3	88.0	
NiS	c	-82.0	-79.5	53.0	47.1
Ni ₃ S ₂	c	-216.0	-210	133.9	117.7
NiS ₂	c	-131.4	-124.7	72	70.6
NiSO ₄	c	-872.9	-759.8	92.0	138.0
std. state	aq	-963.2	-790.3	-108.8	327.9
NiSO ₄ · 7H ₂ O	c	-2976.3	-2462.2	378.94	364.59
NiWO ₄	c	-1128.4		118.0	136.0
Niobium					
Nb	c	0	0	36.4	24.67
NbBr ₅	c	-556	-508	258.8	147.9
NbC	c	-138.9	-136.8	34.98	36.23
NbCl ₅	c	-797.5	-683.3	210.5	148.1
NbF ₅	c	-1813.8	-1699.0	160.3	134.7
NbI ₅	c	-268.6		343	155.6
NbN	c	-236.4	-205.9	34.5	39.0
NbO	c	-405.8	-392.6	48.1	41.3
NbO ₂	c	-796.2	-740.5	54.5	57.45
Nb ₂ O ₅	c	-1899.5	-1765.8	137.3	132.0
NbOCl ₃	c	-879.5	-782	159	120.0
Nitrogen					
N atomic	g	472.68(40)		153.301(3)	
N ₂	g	0	0	191.609(4)	29.124
N ₃ ⁻	aq	275.1	348.2	107.9	
NCl ₃	lq	230.0			
NF ₂	g	43.1	57.8	249.9	41.0
NF ₃	g	-132.1	-90.6	260.8	53.37
H ₂ NOH	c	-114.2			
N ₂ F ₂ <i>cis</i>	g	69.5	109	259.8	49.96
<i>trans</i>	g	82.0	120.5	262.6	53.47

TABLE 6.3 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of the Elements and Inorganic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ · mol ⁻¹	$\Delta_f G^\circ$ kJ · mol ⁻¹	S° J · deg ⁻¹ · mol ⁻¹	C_p° J · deg ⁻¹ · mol ⁻¹
N ₂ F ₄	g	-8.4	79.9	301.2	79.2
N ₂ H ₄ hydrazine	lq	50.6	149.3	121.2	98.84
N ₂ H ₄ hydrazine- <i>d</i> ₄	g	81.6	150.9	248.86	55.52
N ₂ H ₅ ⁺ std. state	aq	-7.5	82.4	151	70.3
N ₂ H ₅ Br	c	-155.6			
std. state	aq	-128.9	-21.8	233.1	-71.6
N ₂ H ₅ Cl	c	-197.1			
std. state	aq	-174.9	-49.0	207.1	-66.1
N ₂ H ₅ Cl · HCl	c	-367.4			
N ₂ H ₅ OH	lq	-242.7			
undissoc; std. state	aq	-251.50	-109.2	207.9	73.2
N ₂ H ₅ NO ₃	c	-251.58			
std. state	aq	-215.10	-28.91	297	
(N ₂ H ₅) ₂ SO ₄	c	-959.0			
std. state	aq	-924.7	-579.9	322	-151
NO	g	91.29	87.60	210.76	29.85
NOBr	g	82.23	82.42	273.7	45.48
NOCl	g	51.71	66.10	261.68	44.7
NOF	g	-66.5	-51.0	248.02	41.3
NOF ₃	g	-163	-96	278.40	67.86
NO ₂	g	33.1	51.3	240.1	37.2
NO ₂	aq	-104.6	-32.2	123.0	-97.5
NO ₂ Cl	g	12.6	54.4	272.19	53.19
NO ₂ F	g	-109	-66	260.2	49.8
NO ₃	g	69.41	114.35	252.5	46.9
NO ₃ ⁻	aq	-206.85(40)	-111.3	146.70(40)	-86.6
N ₂ O	g	81.6	103.7	220.0	38.62
N ₂ O ₂	g	170.37	202.88	287.52	63.51
N ₂ O ₂ ⁻ hyponitrite	aq	-17.2	138.9	27.6	
N ₂ O ₃	g	86.6	142.4	314.7	72.72
N ₂ O ₄	lq	-19.5	97.5	209.20	142.71
	g	11.1	99.8	304.38	79.2
N ₂ O ₅	g	11.3	117.1	355.7	95.30
NSF	g			259.8	44.1
Osmium					
Os	c	0	0	32.6	24.7
OsCl ₃	c	-190.4	-121	130	
OsCl ₄	c	-254.8	-159	155	
OsF ₆	g			358.1	120.8
OsO ₄	c	-394.1	-305.0	143.9	
	g	-337.2	-292.8	293.8	74.1
Oxygen					
O atomic	g	249.18(10)	231.7	161.059(3)	21.9
O ₂	g	0	0	205.152(5)	29.4
O ₃	g		142.7	163.2	238.92
OF ₂	g	24.5	41.8	247.5	57.11
O ₂ F ₂	g	18.0	61.42	268.11	54.06
OH ⁻	aq	-230.015(40)	-157.28	-10.90(20)	-148.5
Palladium					
Pd	c	0	0	37.61	25.94
Pd ²⁺ std. state	aq	149.0	176.6	-184.0	

TABLE 6.3 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of the Elements and Inorganic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ · mol ⁻¹	$\Delta_f G^\circ$ kJ · mol ⁻¹	S° J · deg ⁻¹ · mol ⁻¹	C_p° J · deg ⁻¹ · mol ⁻¹
PdBr ₂	c	-104.2			
PdBr ₄ ²⁻ std. state	aq	-384.9	-318.0	247	
PdCl ₂	c	-171.5	-125.1	105	
PdCl ₄ ²⁻ std. state	aq	-550.2	-416.7	167	
Pd ₂ H	c	-19.7	-5.0	91.6	
PdO	c	-85.4		56.1	31.5
PdS	c	-75	-67	46	
PdS ₂	c	-81.2	-74.5	80	
Phosphorus					
P white	c	0	0	41.09(25)	23.83
	g	316.5(10)	280.1	163.1199(3)	20.8
red, V	c	-17.46	-12.46	22.85	21.19
P ₂	g	144.0(20)		218.123(4)	
P ₄	g	58.9(3)	24.4	280.01(50)	67.16
PBr ₃	lq	-184.5	-175.5	240.2	
	g	-139.3	-162.8	348.15	76.02
PBr ₅	c	-269.9			
PCl ₃	lq	-319.7	-272.4	217.2	
	g	-227.1	-267.8	311.8	71.8
PCl ₅	c	-443.5			
	g	-374.9	-305.0	364.6	112.8
PF ₃	g	-958	-937	273.1	58.69
PF ₅	g	-1594.4	-1520.7	300.8	84.8
PH ₃	g	5.4	13.4	210.24	37.10
std. state	aq	-9.50	25.31	120.1	
PH ₄ Br	c	-127.6	-47.7	110.0	
PH ₄ Cl	c	-145.2			
PH ₄ I	c	-69.9	0.8	123.0	109.6
PH ₄ OH undissoc; std. state	aq	-295.35	-211.88	190.0	
PI ₃	c	-45.6			
PO ₂	g	-279.9	-281.6	252.1	39.5
PO ₃ ⁻	aq	-977.0			
PO ₃ ³⁻ std. state	aq	-1277.4	-1018.8	-220.5	
P ₂ O ₇ ⁴⁻ std. state	aq	-2271.1	-1919.2	-117.0	
(P ₂ O ₃) ₂ dimer	c	-1640.1			
P ₄ O ₁₀	c	-3009.9	-2723.3	228.78	211.71
POBr ₃	c	-458.6			
	g	-389.11	-390.91	-359.84	89.87
POCl ₃	lq	-597.1	-520.9	222.46	138.82
	g	-558.5	-512.9	325.5	84.94
POClF ₂	g	-970.7	-924.1	301.68	68.83
POCl ₂ F	g	-765.7	-721.6	320.38	79.32
POF ₃	g	-1254.0	-1206	285.4	68.82
PSCl ₃	g	-363.2	-347.7	337.23	89.83
PSF ₃	g	-1009	-985	298.1	74.55
P ₄ S ₃	c	-155	-159	201	146
Platinum					
Pt	c	0	41.63	25.87	
PtBr ₂	c	-82.0			
PtBr ₃	c	-120.9			
PtBr ₄	c	-156.5			

TABLE 6.3 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of the Elements and Inorganic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ · mol ⁻¹	$\Delta_f G^\circ$ kJ · mol ⁻¹	S° J · deg ⁻¹ · mol ⁻¹	C_p° J · deg ⁻¹ · mol ⁻¹
PtCl ₂	c	-123.4		117	
PtCl ₃	c	-182.0	-134	151	
PtCl ₄	c	-3218			
PtCl ₄ ⁻	c	-231.8	-172	176	
PtCl ₄ ⁻ std. state	aq	-499.2	-361.5	155	
PtCl ₆ ²⁻ std. state	aq	-668.2	-482.8	220.1	
PtF ₆	g			348.3	122.8
PtI ₄	c	-72.8			
PtS	c	-81.6	-76.2	55.06	43.39
PtS ₂	c	-108.8	-99.6	74.68	65.90
Plutonium					
Pu	c	0	0	51.5	35.5
Pu ³⁺	aq	-579.9	-587.9	-163	
Pu ⁴⁺	aq	-579.9	-1490		
PuBr ₃	c	-831.8	-804.6	192.88	107.86
PuCl ₃	c	-961.5	-892.7	159.00	102.84
PuCl ₄	c	-1381			
PuF ₃	c	-1552	-1478.8	112.97	96.82
PuF ₄	c	-1732	-1644.7	161.9	120.8
PuF ₆	c	25.48	27.2	222.59	167.36
PuH ₂	c	-139.3	-101.7	59.8	39.0
PuH ₃	c	-138	-82.4	64.9	43.2
PuI ₃	c	-648.5	-643.9	214.2	111.8
PuO	c	-565	-538.9	70.7	51.3
PuO ₂	c	-1058.1	-1005.8	82.4	68.6
Pu ₂ O ₃ beta	c	-1715.4	-1632.3	152.3	131.0
Pu(SO ₄) ₂	c	-2200.8	-1969.5	163.18	181.96
PuS	c	-439.3	-436.7	78.24	53.97
Pu ₂ S ₃	c	-989.5	-985.5	192.46	129.66
Polonium					
Po	c	0	0	62.8	26.4
PoO ₂	c	-251	-197	71	61.5
Potassium					
K	c	0	0	64.68(20)	29.60
	lq	2.284	0.264	71.46	32.72
	g	89.0(8)		160.341(3)	
K ⁺ std. state	aq	-252.14(8)	-283.26	101.20(20)	21.8
KOAc acetate	c	-723.0			
	aq	-738.39	-652.66	189.1	15.5
KAg(CN) ₂	aq	18.0	22.2	297	
KAgCl ₂	aq	-497.4	-498.7	333.9	
K ₂ AgI ₃	aq	-686.6	-720.5	458.1	
KAlCl ₄	c	97	-1094	197	156.4
K ₃ AlCl ₆	c	-2092.0	-1938	377	248.9
K ₃ AlF ₆	c	-3358.1		284.5	221.1
KAl(SO ₄) ₂	c	-2470.2	-2240.1	204.47	192.92
K ₃ AsO ₄ std. state	aq	-1645.27	-1498.29	144.8	
KBF ₄	c	-1887	-1785	133.9	114.48
std. state	aq	-1827.2	-1770.3	285	
KBH ₄	c	-227.4	-160.2	106.31	96.57
std. state	aq	-204.22	-168.99	212.97	

TABLE 6.3 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of the Elements and Inorganic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ · mol ⁻¹	$\Delta_f G^\circ$ kJ · mol ⁻¹	S° J · deg ⁻¹ · mol ⁻¹	C_p° J · deg ⁻¹ · mol ⁻¹
KBO ₂	c	-981.6	-923.4	79.98	66.7
std. state	aq	-1024.75	-962.19	65.3	
K ₂ B ₄ O ₇	c	-3334.2	-3136.8	208	170.5
KBr	c	-393.8	-380.7	95.9	52.3
std. state	aq	-373.92	-387.23	184.9	-120.1
KBrO ₃	c	-360.2	-271.2	149.2	105.2
	aq	-319.45	-264.72	264.22	
KBrO ₄	c	-287.86	-174.47	170.01	120.2
KCl	c	-436.5	-408.5	82.55	51.29
std. state	aq	-419.53	-414.51	159.0	-114.6
KClO std. state	aq	-359.4	-320.1	146	
KClO ₂ std. state	aq	-318.8	-266.1	203.8	
KClO ₃	c	-397.73	-296.31	143.1	100.3
std. state	aq	-356.35	-291.29	264.9	
KClO ₄	c	-432.8	-303.1	151.0	112.41
std. state	aq	-381.71	-291.88	284.5	
KCN	c	-113.1	-101.9	128.52	66.3
std. state	aq	-101.7	-110.9	196.7	
K ₂ CO ₃	c	-1151.0	-1063.5	155.5	114.44
std. state	aq	-1181.90	-1094.41	148.1	
K ₂ C ₂ O ₄	c	-1346.0			
	aq	-1329.72			
K ₂ CrO ₄	c	-1403.7	-1295.8	200.12	145.98
std. state	aq	-1385.91	-1294.36	255.2	
K ₂ Cr ₂ O ₇	c	-2061.5	-1882.0	291.2	219.2
K ₂ CuCl ₄ · 2H ₂ O	c	-1707.1	-1492.9	355.43	253.22
KF	c	-567.2	-537.8	66.5	48.98
std. state	aq	-585.01	-562.08	88.7	-84.9
K ₃ Fe(CN) ₆	c	-249.8	-129.7	426.06	
std. state	aq	-139.4	-120.5	577.8	
K ₄ Fe(CN) ₆	c	-594.1	-453.1	418.8	322.2
std. state	aq	-554.0	-438.11	505.0	
K formate	c	-679.73			
std. state	aq	-677.93	-634.3	192	-66.1
K glycinate	aq	-722.16	-598.23	221.8	
KH	c	-57.72	-53.01	50.21	37.91
K ₂ HAsO ₄ std. state	aq	-1411.10	-1281.22	203.3	
KH ₂ AsO ₄	c	-1180.7	-1036.0	155.02	126.73
std. state	aq	-1161.94	-1036.54	218	
KHCrO ₄ std. state	aq	-1130.5	-1048.1	286.6	
KHCO ₃	c	-963.2	-863.6	115.5	
std. state	aq	-944.33	-870.10	193.7	
KHC ₂ O ₄ std. state	aq	-1070.7	-981.7	251.9	
KHF ₂	c	-927.7	-859.7	104.3	76.94
	aq	-902.32	-861.40	195.0	
KHgBr ₃	c	-550.20			
std. state	aq	-545.6	-542.7	360	
K ₂ HgBr ₄	c	-963.6			
std. state	aq	-935.5	-937.6	515	
KHgCl ₃	c	-671.1			
std. state	aq	-641.0	-592.5	314	

TABLE 6.3 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of the Elements and Inorganic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ · mol ⁻¹	$\Delta_f G^\circ$ kJ · mol ⁻¹	S° J · deg ⁻¹ · mol ⁻¹	C_p° J · deg ⁻¹ · mol ⁻¹
K ₂ Hg(CN) ₄	c	-32.2			
std. state	aq	21.8	51.9	510	
K ₂ HgI ₄	c	-775.0			
std. state	aq	-739.7	-778.2	565	
KH ₂ PO ₄	c	-1568.33	-1415.95	134.85	116.57
std. state	aq	-1548.67	-1622.85	192.9	
K ₂ HPO ₄ std. state	aq	-1796.90	-1655.78	171.5	
K ₂ H ₂ P ₂ O ₇	c	-2815.8			
	aq	-2783.2	-2576.9	368	
K ₃ HP ₂ O ₇	aq	-3032.1	-2822.1	351	
KHS	c	-265.10			75.3
std. state	aq	-269.9	-271.21	165.3	
KHSO ₃	aq	-878.60	-811.07	242.3	
KHSO ₄	c	-1160.6	-1131.4	138.1	
std. state	aq	-1139.72	-1039.26	234.3	-63.0
KI	c	-327.9	-324.9	106.3	52.9
	aq	-307.57	-334.85	213.8	-120.5
KIO ₃	c	-510.43	-418.4	151.46	106.48
	aq	-473.6	-411.3	220.9	
KIO ₄	c	-467.23	-361.41	175.7	
	aq	-403.8	-341.8	322	
KMnO ₄	c	-837.2	-737.6	171.71	117.6
K ₂ MoO ₄	c	-1498.71			
std. state	aq	-1502.5	-1402.9	232.2	
KNH ₂ amide	c	-128.9			
KNO ₂	c	-369.82	-306.60	152.09	107.40
std. state	aq	-356.9	-315.5	225.5	
KNO ₃	c	-494.63	-394.93	133.05	96.4
std. state	aq	-459.74	-394.59	249.0	-64.9
K ₂ Ni(CN) ₄ std. state	aq	-136.8	-94.6	423	
K ₂ O	c	-361.5	-322.1	94.1	83.7
KO ₂	c	-284.9	-239.4	122.5	77.53
K ₂ O ₂	c	-494.1	-425.1	102.0	110
KOCN cyanate	c	-418.65			
std. state	aq	-398.3	-380.7	209.2	
KOH	c	-424.7	-378.7	78.9	64.9
std. state	aq	-482.37	-440.53	91.6	-126.8
K ₂ PdBr ₄	c	-938.1			
std. state	aq	-889.5	-884.5	452	
K ₃ PO ₄	c	-1950.2			
std. state	aq	-2034.7	-1868.6	87.9	
K ₄ P ₂ O ₇	aq	-3280.7	-3052.2	293	
K ₂ PtBr ₄	c	-915.0			
std. state	aq	-872.8	-828.4	326.4	
K ₂ PtBr ₆	c	-1021.3			
std. state	aq	-975.3	-898.7	368	
K ₂ PtCl ₄	c	-1054.4			180.2
std. state	aq	-1003.7	-928.0	360	
K ₂ PtCl ₆	c	-1229.3	-1078.6	333.9	205.60
std. state	aq	-1171.8	-1049.4	424.7	
K ₂ ReCl ₆	c	-1310.4	-1172.8	371.71	214.68
std. state	aq	-1266.92	-1156.0	460	

TABLE 6.3 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of the Elements and Inorganic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ · mol ⁻¹	$\Delta_f G^\circ$ kJ · mol ⁻¹	S° J · deg ⁻¹ · mol ⁻¹	C_p° J · deg ⁻¹ · mol ⁻¹
KReO ₄	c	-1097.0	-994.5	167.82	122.55
std. state	aq	-1039.7	-977.8	303.8	8.4
K ₂ S	c	-380.7	-364.0	105.0	74.7
std. state	aq	-471.5	-480.7	190.4	
K ₂ S ₂	c	-432.2			
	aq	-474.5	-487.0	233.5	
KSCN	c	-200.16	-178.32	124.26	88.53
std. state	aq	-175.94	-190.58	246.9	-18.4
K ₂ SeO ₃	c	-979.5			
std. state	aq	-1013.8	-936.4	218.0	
K ₂ SeO ₄	c	-1110.02	-1002.9	222	
std. state	aq	-1103.7	-1007.9	259.0	
K ₂ SiF ₆	c	-2956.0	-2798.7	225.9	
std. state	aq	-2893.7	-2766.0	327.2	
K ₂ SiO ₃	c	-1548.1	-1455.7	146.1	118.4
K ₂ SnBr ₆	c	-1218.0	-1160.2	443.1	246.0
K ₂ SnCl ₆	c	-1477.0	-1333.0	366.5	246.0
K ₂ SO ₃	c	-1125.5			
std. state	aq	-1140.1	-1053.1	176	
K ₂ SO ₄	c	-1437.8	-1321.4	175.6	131.5
	aq	-1414.0	-1311.1	225.1	-251.0
K ₂ SO ₆	c	-1437.7	-1319.6	175.5	131.3
std. state	aq	-1414.02	-1311.14	225.1	-251
K ₂ S ₂ O ₃	c	-1173.6			
std. state	aq	-1156.9	-1089.1	272	
K ₂ S ₂ O ₄	aq	-1258.1	-1166.9	297	
K ₂ S ₂ O ₇	c	-1986.6	-1791.6	255	
K ₂ S ₂ O ₈	c	-1916.10	-1697.41	278.7	213.2
std. state	aq	-1849.3	-1681.6	449.4	
K ₂ S ₄ O ₆	c	-1780.7	-1613.43	309.66	230.79
std. state	aq	-1728.8	-1607.1	462.3	-24.3
KSO ₃ F	c	-1159.0			
K ₂ UO ₄	c	-1921.3			
KVO ₄	c	-1154.8			
std. state	aq	-1140.6	-1066.9	155	
K ₂ Zn(CN) ₄	c	-100.0			
std. state	aq	-162.3	-119.7	431	
Praseodymium					
Pr	c	0	0	73.2	27.20
Pr ³⁺ std. state	aq	-704.6	-679.1	-209.0	-29.0
Pr(OAc) ₃ std. state	aq	-2147.52	-1805.56	164.9	
PrCl ₃	c	-1056.9			100.0
std. state	aq	-1206.3	-1072.8	-42.0	-439.0
Pr(NO ₃) ₃	c	-1229.3			
Pr ₂ O ₃	c	-1809.6			117.40
Promethium					
PmCl ₃	c	-1054.0			
Protactinium					
Pa	c	0	0	51.8	
Pa ⁴⁺	aq	-619.2			
PaBr ₄	c	-824.0	-787.9	234.0	
PaBr ₅	c	-862	-820	289	

TABLE 6.3 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of the Elements and Inorganic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ · mol ⁻¹	$\Delta_f G^\circ$ kJ · mol ⁻¹	S° J · deg ⁻¹ · mol ⁻¹	C_p° J · deg ⁻¹ · mol ⁻¹
PaCl ₄	c	-1043.1	-953.0	192.0	
PaCl ₅	c	-1144.7	-1034.3	238.0	
Radium					
Ra	c	0	0	71	
Ra ²⁺	aq	-527.6	-561.5	54.0	
RaCl ₂ std. state	aq	-861.9	-823.8	167.0	
Ra(NO ₃) ₂	c	-992	-796.2	222	
std. state	aq	-942.2	-784.1	347.0	
RaSO ₄	c	-1471.1	-1365.7	138	
std. state	aq	-1436.8	-1306.2	75.0	
Radon					
Rn	g	0	0	176.235	20.79
Rhenium					
Re	c	0	0	36.9	25.5
	g	769.9	724.6	188.9	20.8
Re ⁻ std. state	aq	46.0	10.1	230.0	
ReBr ₃	c	-167.0			
ReCl ₃	c	-264	-188	123.9	92.4
ReCl ₆ ²⁻ std. state	aq	-761	-590	251	
ReO ₂	c	-423	-368	172	
ReO ₃	c	-605.0	-531	257.3	
Re ₂ O ₇	c	-1240.1	-1066.1	207.1	166.1
	g	-1100.0	-994.0	452.0	
Rhodium					
Rh	c	0	0	31.51	24.98
RhCl ₃	c	-299.2			
Rh ₂ O ₃	c	-343.0		110.9	104.0
Rubidium					
Rb	c	0	0	76.78(30)	31.06
	g	80.9(8)	53.1	170.094(3)	20.8
Rb ⁺ std. state	aq	-251.12(10)	-283.97	121.75(25)	
Rb acetate	aq	-737.2	-653.3	207.9	
RbBO ₂	c	-971.0	-913.0	94.3	74.1
RbBr	c	-394.59	-381.79	109.96	52.84
std. state	aq	-372.71	-387.94	203.93	
RbBrO ₃	c	-367.27	-278.11	161.1	
Rb ₂ CO ₃	c	-1136.0	-1051.0	181.33	117.61
std. state	aq	-1179.5	-1095.8	186.2	
RbCl	c	-435.35	-407.81	95.90	52.41
std. state	aq	-418.32	-415.22	178.0	
RbClO ₃	c	-402.9	-300.4	151.9	103.2
std. state	aq	-355.14	-291.9	283.68	
RbClO ₄	c	-437.19	-306.9	161.1	
std. state	aq	-380.49	-292.59	303.3	
RbF	c	-557.7		75.3	50.5
std. state	aq	-583.79	-562.79	107.53	
Rb formate	aq	-676.7	-635.1	213.0	
RbHCO ₃	c	-963.2	-863.6	121.3	
std. state	aq	-943.16	-870.82	212.71	
RbHF ₂	c	-922.6	-855.6	120.08	79.37
std. state	aq	-901.11	-862.11	213.8	

TABLE 6.3 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of the Elements and Inorganic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ · mol ⁻¹	$\Delta_f G^\circ$ kJ · mol ⁻¹	S° J · deg ⁻¹ · mol ⁻¹	C_p° J · deg ⁻¹ · mol ⁻¹
RbHSO ₄	c	-1159.0			
std. state	aq	-1138.51	-1039.98	253.1	
RbI	c	-333.8	-328.9	118.4	53.18
std. state	aq	-306.35	-335.56	232.6	
RbNO ₂	c	-367.4	-306.2	172.0	
RbNO ₃	c	-495.05	-395.85	147.3	102.1
std. state	aq	-458.52	-395.30	267.8	
Rb ₂ O	c	-339			
Rb ₂ O ₂	c	-472.0			
RbOH	c	-418.19			
std. state	aq	-481.16	-441.24	110.75	
Rb ₂ PtCl ₆	c	-1245.6	-1109.6	406	
std. state	aq	-1170.7	-1056.6	464	
RbReO ₄	c	-1102.9	-996.2	167	
std. state	aq	-1038.5	-978.6	322.6	
Rb ₂ S	aq	-469.4	-482.0	228.4	
Rb ₂ SeO ₄	c	-1114.2			
std. state	aq	-1101.7	-1009.2	297.1	
Rb ₂ SO ₄	c	-1435.61	-1316.96	197.44	134.06
std. state	aq	-1411.60	-1312.56	263.2	
Ruthenium					
Ru	c	0	0	28.53	24.1
RuBr ₃	c	-138.0			
RuCl ₃	c	-205.0			
RuI ₃	c	-65.7			
RuO ₂	c	-305.0			
RuO ₄	c	-239.3	-152.3	146.4	
	lq	-228.5	-152.3	183.3	
Samarium					
Sm	c	0	0	69.58	29.54
Sm ³⁺ std. state	aq	-691.6	-666.5	-211.7	-21
SmCl ₂	c	-815.5			
SmCl ₃	c	-1025.9			
std. state	aq	-1193.3	-1060.2	-42.7	-431
SmF ₃	c	-1778.0			
SmF ₃ · ½H ₂ O	c	-1825.1			
SmI ₃	c	-620.1			
Sm(IO ₃) ₃	c	-1381			
Sm(NO ₃) ₂	c	-1212.1			
Sm ₂ O ₃	c	-1823.0	-1734.7	151.0	114.5
Sm ₂ (SO ₄) ₃	c	-3899.1			
Scandium					
Sc	c	0	0	34.64	25.52
Sc ³⁺ std. state	aq	-614.2	-586.6	-255.0	
ScBr ₃	c	-743.1			
ScCl ₃	c	-925.1		121.3	93.64
ScF ₃	c	-1629.2	-1555.6	92	
ScOH ²⁺	aq	-861.5	-801.2	-134.0	
Sc ₂ O ₃	c	-1908.8	-1819.41	76.99	94.2

TABLE 6.3 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of the Elements and Inorganic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ · mol ⁻¹	$\Delta_f G^\circ$ kJ · mol ⁻¹	S° J · deg ⁻¹ · mol ⁻¹	C_p° J · deg ⁻¹ · mol ⁻¹
Selenium					
Se	c	0	0	41.97	24.98
	g	227.1	187.0	174.8	22.1
SeBr ₂	g	-21.0			
SeCl ₄	c	-188.3			
SeF ₆	g	-1117.0	-1017.0	313.8	110.5
SeO	g	53.4	26.8	234.0	31.3
SeO ₂	c	-225.4			
SeO ₃	c	-166.9			
SeO ₃ ²⁻ std. state	aq	-509.2	-369.9	13	
SeO ₄ ²⁻	aq	-599.2	-441.4	54.0	
Silicon					
Si	c	0	0	18.81(8)	20.00
	g	450.(8)		167.981(4)	
SiBr ₄	lq	-457.3	-433.9	277.5	146.4
	g	-415.5	-431.8	377.9	97.1
SiBrCl ₃	g			350.1	90.9
SiC alpha	c	-62.8	-60.2	16.49	26.76
beta	c	-65.3	-62.8	16.61	26.9
SiCl ₄	lq	-686.93	-620.0	239.7	145.3
	g	-657.0	-617.0	330.7	90.26
SiClBr ₃	g			377.1	95.3
SiClF ₃	g	-1318	-1280	309	79.4
SiF ₄	g	-1615.0(8)	-1572.7	282.76(50)	73.62
SiH ₄	g	34.3	56.8	204.65	42.83
SiHBr ₃	g	-317.6	-328.5	348.6	80.8
SiHCl ₃	lq	-539.3	-482.5	227.6	
	g	-513.0	-482.0	313.7	75.8
SiHF ₃	g			271.9	60.5
SiH ₂ Cl ₂	g	-320.5	-295.0	285.7	60.5
SiH ₃ Cl	g	-142	-119	250.8	51.10
SiH ₃ F	g	-377	-353	238.4	47.20
Si ₂ H ₆	g	80.3	127.2	272.7	80.79
SiI ₄	c	-189.5	-191.6	258.1	108.0
	lq	-174.60	-187.49	294.30	159.79
Si ₃ N ₄	c	-743.5	-642.1	101.3	99.5
SiO	g	-99.6	-126.4	211.6	29.9
SiO ₂ quartz	c	-910.7(10)	-856.4	41.46(20)	44.4
high cristobalite	c	-905.5	-853.6	50.05	26.58
SiOF ₂	g	-967	-951	271.3	53.69
SiS ₂	c	-213.4	-212.6	80.3	77.5
Silver					
Ag	c	0	0	42.55(20)	25.4
	g	284.9(8)		172.997(4)	
Ag ⁺ std. state	aq	105.79(8)	77.12	73.45(40)	21.8
Ag ²⁺ in 4M HClO ₄	aq	268.6	269.0	-88	
AgAt	c	-45.2		133.1	55.7
AgBr	c	-100.37	-96.90	107.11	52.38
AgBrO ₃	c	-10.5	71.3	151.9	
AgCl	c	-127.01(5)	-109.8	96.25(20)	50.79
AgClO ₂	c	8.79	75.7	134.56	87.32

TABLE 6.3 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of the Elements and Inorganic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ · mol ⁻¹	$\Delta_f G^\circ$ kJ · mol ⁻¹	S° J · deg ⁻¹ · mol ⁻¹	C_p° J · deg ⁻¹ · mol ⁻¹
AgClO ₃	c	-30.3	64.5	142.0	
AgClO ₄	c	-31.13		162.3	
std. state	aq	-23.77	68.49	254.8	
AgCN	c	146.0	156.9	107.19	66.73
Ag(CN) ₂ ⁻ std. state	aq	270.3	305.4	192	
Ag ₂ CrO ₄	c	-731.74	-641.83	217.6	142.26
Ag ₂ CO ₃	c	-505.9	-436.8	167.4	112.26
Ag ₂ C ₂ O ₄	c	-673.2	-584.1	209	
AgF	c	-204.6		83.7	51.92
AgF ₂	c	-360.0			
AgI	c	-61.84	-66.19	115.5	56.82
AgIO ₃	c	-171.1	-93.7	149.4	102.93
AgN ₃	c	308.8	376.1	104.2	
Ag(NH ₂) ₂ ⁻ std. state	aq	-111.29	-17.24	245.2	
AgNO ₃	c	-124.4	-33.47	140.92	93.05
std. state	aq	-101.80	-34.23	219.2	-64.9
AgO	c	-12.15	13.83	58.5	44.0
Ag ₂ O	c	-31.1	-11.21	121.3	65.86
Ag ₂ O ₃	c	33.9	121.4	100.0	
Ag ₂ S argentite	c	-32.59	-40.67	143.9	76.53
Ag ₃ Sb	c	-23.0		171.5	101.7
AgSCN	c	87.9	101.38	131.0	63
Ag ₂ Se	c	-38	-44.4	150.71	81.76
Ag ₂ SO ₄	c	-715.9	-618.4	200.4	131.4
std. state	aq	-698.10	-590.36	165.7	-251
Ag ₂ Te	c	-37.2	-43.1	154.8	87.5
Sodium					
Na	c	0	0	51.30(20)	28.15
	g	107.5(7)		153.718(3)	
Na ⁺ std. state	aq	-240.34(6)	-261.88	58.45(15)	46.4
NaAg(CN) ₂ std. state	aq	30.12	43.5	251	
NaOAc	c	-708.81	-607.27	123.0	79.9
std. state	aq	-726.13	-631.28	145.6	40.2
NaAlCl ₄	c	-1142.0	-996.4	188.3	154.98
Na ₃ AlCl ₆	c	-1979.0	-1829	347.0	244.1
NaAlF ₄	g	-1869.0	-1827.5	345.7	105.9
Na ₃ AlF ₆	c	-3361.2	-3136.7	239.5	215.89
NaAlH ₄	c	-115.5			
NaAlO ₂	c	-1137.3	-1069.2	70.40	73.64
NaAl(SO ₄) ₂ std. state	aq	-2590	-2238	-222.6	
NaAlSiO ₄	c	-2092.8	-1978.2	124.3	
NaAsO ₂	c	-660.53			
std. state	aq	-669.15	-611.91	99.6	
Na ₃ AsO ₄	c	-1540			
std. state	aq	-1608.50	-1434.19	14.2	
NaAu(CN) ₂	aq	2.1	23.9	230	
NaBF ₄	c	-1844.7	-1750.1	145.31	120.3
std. state	aq	-1812.1	-1748.9	243	
NaBH ₄	c	-188.6	-123.9	101.3	86.8
std. state	aq	-199.60	-147.61	169.5	

TABLE 6.3 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of the Elements and Inorganic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ · mol ⁻¹	$\Delta_f G^\circ$ kJ · mol ⁻¹	S° J · deg ⁻¹ · mol ⁻¹	C_p° J · deg ⁻¹ · mol ⁻¹
NaBO ₂	c	-977.0	-920.7	73.54	65.94
std. state	aq	-1012.49	-940.81	21.8	
NaBO ₃ · 4H ₂ O	c	-2114.2			
Na ₂ B ₄ O ₇	c	-3291.1	-3096.0	189.0	186.8
std. state	aq	-3271.1	-3076.9	192.9	
Na ₂ B ₄ O ₇ · 10H ₂ O	c	-6298.6	-5516.6	586	614.5
NaBr	c	-361.08	-349.00	86.82	51.38
std. state	aq	-361.66	-365.85	141.4	-95.4
NaBr ₃ std. state	aq	-370.54	-368.95	274.5	
NaBrO std. state	aq	-384.3	-295.4	100	
NaBrO ₃	c	-334.09	-242.6	128.9	
std. state	aq	-307.19	-243.34	220.9	
NaBrO ₄ std. state	aq	-227.19	-143.93	-258.57	
Na ₂ [Cd(CN) ₄]	aq	-52.3	-16.3	439	
NaCl	c	-411.2	-384.1	72.1	50.51
std. state	aq	-407.27	-393.17	115.5	-90.0
NaClO std. state	aq	-347.3	-298.7	100	
NaClO ₂	c	-307.02		115.9	
std. state	aq	-306.7	-244.8	160.3	
NaClO ₃	c	-365.77	-262.34	123.4	
std. state	aq	-344.09	-269.91	221.3	
NaClO ₄	c	-383.3	-254.9	142.3	111.3
std. state	aq	-369.45	-270.50	241.0	
NaCN	c	-87.5	-76.4	115.6	70.4
std. state	aq	-89.5	-89.5	153.1	
Na ₃ [Co(NO ₂) ₆]	c	-1423.0			
Na ₂ CO ₃	c	-1130.7	-1044.4	135.0	112.3
std. state	aq	-1157.4	-1051.6	61.6	
Na ₂ CO ₃ · H ₂ O	c	-1431.26	-1285.41	168.11	145.60
Na ₂ CO ₃ · 10H ₂ O	c	-4081.32	-3428.20	564.0	550.32
Na ₂ C ₂ O ₄	c	-1318.0			142
std. state	aq	-1305.4	-1197.9	163.6	
Na ₂ CrO ₄	c	-1342.2	-1235.0	176.61	142.13
std. state	aq	-1361.39	-1251.64	168.2	
Na ₂ Cr ₂ O ₇	c	-1978.6			
std. state	aq	-1970.7	-1825.1	379.9	
Na ethoxide	c	-413.80			
NaF	c	-576.6	-546.3	51.11	46.85
std. state	aq	-572.75	-540.70	45.2	-60.3
Na ₃ [Fe(CN) ₆] std. state	aq	-158.6	-56.5	447.3	
Na ₄ [Fe(CN) ₆] std. state	aq	-505.0	-352.63	231.0	
Na formate	c	-666.5	-600.00	103.76	82.68
std. state	aq	-666.67	-613.0	151	-41.4
NaH	c	-56.34	-33.55	40.02	36.39
Na ₂ HAsO ₄ std. state	aq	-1386.58	-1238.51	116.3	
NaH ₂ AsO ₄ std. state	aq	-1149.68	-1015.16	176	
NaHCO ₃	c	-950.81	-851.0	101.7	87.61
std. state	aq	-932.11	-848.72	150.2	
NaHCrO ₄ std. state	aq	-1118.4	-1026.8	243.1	
NaHF ₂	c	-920.27	-852.20	90.92	75.02
std. state	aq	-890.06	-840.02	151.5	

TABLE 6.3 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of the Elements and Inorganic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ · mol ⁻¹	$\Delta_f G^\circ$ kJ · mol ⁻¹	S° J · deg ⁻¹ · mol ⁻¹	C_p° J · deg ⁻¹ · mol ⁻¹
Na ₂ H ₂ [Fe(CN) ₆]	aq	-24.7	134.64	335	
NaH ₂ PO ₄	c	-1536.8	-1386.2	127.49	116.86
std. state	aq	-1536.4	-1392.27	149.4	
Na ₂ HPO ₄	c	-1748.1	-1608.3	150.50	135.31
std. state	aq	-1772.38	-1613.06	84.5	
Na ₂ H ₂ P ₂ O ₇	c	-2764.8	-2522.5	220.20	198.15
NaHS	c	-237.23			
std. state	aq	-257.73	-249.83	121.8	
NaHSeO ₃	c	-759.23			
std. state	aq	-754.67	-673.41	194.1	
NaHSeO ₄	c	-821.40			
std. state	aq	-821.74	-714.2	208.4	
NaHSO ₄	c	-1125.5	-992.9	113.0	
std. state	aq	-1127.46	-1017.88	190.8	-38
NaI	c	-287.9	-286.1	98.50	52.1
std. state	aq	-295.31	-313.47	170.3	-95.8
NaI ₃	aq	-291.6	-313.4	298.3	
NaIO ₃	c	-481.79		135.1	92.1
std. state	aq	-461.50	-389.95	177.4	
NaIO ₄	c	-429.28	-323.09	163.0	
std. state	aq	-391.62	-320.49	280	
Na methoxide	c	-367.8	-294.80	110.58	69.45
std. state	aq	-433.59	-332.46	17.6	
NaMnO ₄ std. state	aq	-781.6	-709.2	250.2	
Na ₂ MnO ₄	c	-1156.0			
std. state	aq	-1134	-1024.7	176	
Na ₂ MoO ₄	c	-1468.12	-1354.30	159.70	141.71
std. state	aq	-1478.2	-1360.2	145.2	
Na ₂ Mo ₂ O ₇	c	-2245.05	-2058.19	250.6	217.15
NaN ₃	c	21.71	93.76	96.86	76.61
std. state	aq	35.02	86.2	166.9	
NaNH ₂	c	-123.9	-64.0	76.90	66.15
NaNbO ₃	c	-1315.9	1233.0	117	
std. state	aq	-1265.7	-1194.1	155	
NaNO ₂	c	-358.65	-284.60	103.8	
std. state	aq	-344.8	-294.1	182.0	-51.0
NaNO ₃	c	-467.85	-367.06	116.52	92.88
std. state	aq	-447.48	-373.21	205.4	-40.2
Na ₂ [Ni(CN) ₄]	aq	-112.6	-51.9	335	
NaO ₂	c	-260.2	-218.4	115.9	72.14
Na ₂ O	c	-414.2	-375.5	75.04	69.10
Na ₂ O ₂	c	-510.9	-449.6	94.8	89.3
NaOCN cyanate	c	-405.39	-358.2	96.7	86.6
std. state	aq	-386.2	-359.4	165.7	
NaOH	c	-425.6	-379.4	64.4	59.5
std. state	aq	-469.15	-419.20	48.1	-102.1
Na ₃ PO ₄	c	-1917.40	-1788.87	173.80	153.47
std. state	aq	-1997.9	-1804.6	-46	
Na ₄ P ₂ O ₇	c	-3188	-2969.4	270.29	241.12
std. state	aq	-3231.7	-2966.9	117	

TABLE 6.3 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of the Elements and Inorganic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ · mol ⁻¹	$\Delta_f G^\circ$ kJ · mol ⁻¹	S° J · deg ⁻¹ · mol ⁻¹	C_p° J · deg ⁻¹ · mol ⁻¹
NaReO ₄	c	-1057.09	-953.74	151.5	133.89
std. state	aq	-1027.6	-956.5	260.2	
Na ₂ S	c	-364.8	-349.8	83.7	82.8
std. state	aq	-443.3	-438.1	103.3	
Na ₂ S ₂	c	-397.0	-392	151	
std. state	aq	-450.2	-444.3	146.4	
NaSCN	c	-170.50			
std. state	aq	-163.68	-169.20	203.84	6.3
Na ₂ Se	c	-341.4			
Na ₂ SeO ₃	c	-958.6			
std. state	aq	-989.5	-893.7	130	
Na ₂ SeO ₄	c	-1069.0			
Na ₂ SiF ₆	c	-2909.6	-2754.2	207.1	187.1
Na ₂ SiO ₃	c	-1554.9	-1462.8	113.8	111.9
Na ₂ Si ₂ O ₅	c	-2470.1	-2324.1	164.1	157.0
NaSnBr ₃	aq	-615.1	-608.8	310	
NaSnCl ₃	aq	-727.2	-692.0	318	
Na ₂ SO ₃	c	-1100.8	-1012.5	145.94	120.25
std. state	aq	-1115.87	-1010.44	87.9	
Na ₂ SO ₄	c	-1387.1	-1270.2	149.6	128.2
std. state	aq	-1389.51	-1268.40	138.1	-201
Na ₂ SO ₄ · 10H ₂ O	c	-4327.26	-3647.40	592.0	
Na ₂ S ₂ O ₃	c	-1123.0	-1028.0	155	
std. state	aq	-1132.40	-1046.0	184.1	
Na ₂ S ₂ O ₃ · 5H ₂ O	c	-2607.93	-2230.1		
Na ₂ S ₂ O ₄ dithionate	c	-1232.2			
std. state	aq	-1233.9	-1124.2	209.2	
Na ₂ S ₂ O ₇	c	-1925.1	-1722.1	202.1	
Na ₂ S ₂ O ₈	aq	-1825.1	-1638.9	362.3	
Na ₂ Te	c	-349.4			
Na ₂ TeO ₄	c	-1270.7			
Na ₂ TiO ₃	c	-1591.2	-1496.2	121.67	125.65
Na ₂ UO ₄ beta	c	-1893.3	-1777.78	166.02	146.65
Na ₃ UO ₄	c	-2025.1	-1901.2	198.20	173.01
NaVO ₃	c	-1145.79	-1064.12	113.68	97.57
std. state	aq	-1128.4	-1045.6	109	
Na ₃ VO ₄	c	-1757.87	-1637.83	190.0	164.85
Na ₂ V ₂ O ₇	c	-2918.84	-2712.52	318.4	269.74
Na ₂ WO ₄	c	-1544.7	-1429.8	160.3	139.8
Na ₂ [Zn(CN) ₄]	aq	-138.1	-77.0	343	
Strontium					
Sr	c	0	0	55.0	26.79
Sr ²⁺ std. state	aq	-545.8	-559.44	-32.6	
Sr(OAc) ₂	c	-1487.4			
Sr ₃ (AsO ₄) ₂	c	-3317.1	-3080.3	255	
SrBr ₂	c	-717.6	-697.1	135.1	75.3
	aq	-788.89	-767.39	132.2	
SrCl ₂	c	-828.9	-781.1	114.9	75.59
std. state	aq	-880.10	-821.95	80.3	
Sr(ClO ₄) ₂	c	-762.69			
std. state	aq	-804.46	-576.68	331.4	

TABLE 6.3 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of the Elements and Inorganic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ · mol ⁻¹	$\Delta_f G^\circ$ kJ · mol ⁻¹	S° J · deg ⁻¹ · mol ⁻¹	C_p° J · deg ⁻¹ · mol ⁻¹
SrCO ₃	c	-1220.1	-1140.1	97.1	81.42
	aq	-1222.9	-1087.3	-89.5	
SrC ₂ O ₄	c	-1370.7			
SrF ₂	c	-1216.3	-1164	82.1	70.0
Sr formate	c	-1393.3			
SrHPO ₄	c	-1821.7	-1688.7	121	
Sr(H ₂ PO ₄) ₂	c	-3134.7			
SrI ₂	c	-558.1	-557.7	159.1	77.95
std. state	aq	-656.18	-662.62	190.0	
Sr(IO ₃) ₂	c	-1019.2	-855.2	234	
SrMoO ₄	c	-1561.1		128.9	117.07
Sr(NO ₂) ₂	c	-762.3			
Sr(NO ₃) ₂	c	-978.22	-780.0	194.56	149.87
std. state	aq	-960.52	-782.12	260.2	
SrO	c	-592.0	-561.9	54.4	45.0
SrO ₂	c	-654.4		54	79.45
Sr(OH) ₂	c	-959	-881	97	74.9
Sr ₃ (PO ₄) ₂	c	-4122.9			
SrS	c	-472.4	-467	68.2	48.7
SrSe	c	-385.8			
SrSeO ₃	c	-1047.7			
SrSeO ₄	c	-1142.7			
SrSiO ₃	c	-1633.9	-1549.8	96.7	88.53
Sr ₂ SiO ₄	c	-2304.6	-2191.2	153.1	134.26
SrSO ₃	c	-1177.0			
SrSO ₄	c	-1453.1	-1341.0	117.0	107.78
	aq	-1455.1	-1304.0	-12.6	
Sr ₂ TiO ₄	c	-2287.4	-2178.6	159.0	143.68
Sulfur					
S rhombic	c	0	0	32.054(50)	22.60
monoclinic	c	0.360	-0.070	33.03	23.23
	g	277.17(15)		167.829(6)	
S ₂ ²⁻	aq	33.1	85.8	-14.6	
S ₂	g	128.60(30)		228.167(10)	
S ₈	g	101.25	49.16	430.20	156.06
S ₂ Br ₂	lq	-13.0			
SCl ₂	lq	-50.0	-28.5	184	91.0
SClF ₃	lq	-1065.7			
S ₂ Cl ₂	lq	-59.4	-39	224	124.3
SCN ⁻	aq	76.4	92.7	144.3	-40.2
SF ₄	g	-763.2	-722.0	299.6	77.60
SF ₆	g	-1220.5	-1116.5	291.5	96.96
S ₂ F ₁₀	g	-2064	-1861	397	176.7
SO	g	6.3	-19.9	222.0	30.2
SO ₂	g	-296.81(20)	-300.13	248.223(50)	39.88
SO ₃	g	-395.7	-371.02	256.77	50.66
SOCl ₂	g	-212.50	-198.3	309.8	66.5
SOF ₂	g	-544	-502	278.7	56.81
SO ₂ Cl ₂	g	-364.0	-320.0	311.9	77.01
SO ₂ ClF	g	-556	-513	303	71.6
SO ₂ F ₂	g	-759	-712	284.0	66.0

TABLE 6.3 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of the Elements and Inorganic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ · mol ⁻¹	$\Delta_f G^\circ$ kJ · mol ⁻¹	S° J · deg ⁻¹ · mol ⁻¹	C_p° J · deg ⁻¹ · mol ⁻¹
SO ₃ ²⁻	aq	-635.5	-486.5	-29.0	
SO ₃ ⁻	aq	-909.34(40)	-744.5	18.50(40)	-293.0
S ₂ O ₃ ²⁻	aq	-652.3	-522.5	67.0	
S ₂ O ₄ ²⁻	aq	-753.5	-600.3	92.0	
S ₂ O ₈ ²⁻	aq	-1344.7	-1114.9	244.3	
Tantalum					
Ta	c	0	0	41.47	25.40
TaB ₂	c	-209.2		44.4	48.12
TaBr ₅	c	-598.3		305.4	155.73
TaC	c	-144.1	-142.7	42.37	36.79
Ta ₂ C	c	-197.5		83.7	60.96
TaCl ₅	c	-859.0	-746	222	148
TaF ₅	c	-1903.6		195.0	130.46
Ta ₂ H	c	-32.6	-69.0	79.1	90.8
TaI ₅	c	-490		343	155.6
TaN	c	-251		50.6	42.1
TaO ₂	g	-201	-209	280	44.0
Ta ₂ O ₅	c	-2046	-1911.0	143.1	135.0
TaOCl ₃	g	-780.7		361.5	98.53
Technetium					
Tc	c	0	0	33.47	24.27
Tc ₂ O ₇	c	-1113			
Tellurium					
Te	c	0	0	49.70	25.70
TeBr ₄	c	-190.4			
TeCl ₄	c	-326.4		209	138.5
TeF ₆	g	-1318.0		335.77	116.90
TeO ₂	c	-322.6	-270.3	79.5	63.89
Te(OH) ₃ ⁺	aq	-322.6	-496.1	111.7	
Terbium					
Tb	c	0	0	73.22	28.91
Tb ³⁺ std. state	aq	-682.8	-651.9	-226.0	17.0
TbCl ₃	c	-997.1			
std. state	aq	-1184.1	-1045.6	-59.0	-393.0
TbO ₂	c	-971.5			
Tb ₂ O ₃	c	-1865.2			115.9
Tb ₂ (SO ₄) ₃ std. state	aq	-4131.7	-3597.4		
Thallium					
Tl	c	0	0	64.18	26.32
Tl ⁺ std. state	aq	5.36	-32.38	125.5	
Tl ³⁺ std. state	aq	196.6	214.6	-192.0	
TlBr	c	-173.2	-167.36	120.5	50.50
std. state	aq	-116.19	-136.36	207.9	
TlBr ₃	aq	-168.2	-97.1	54.0	
TlBrO ₃	c	-136.4	-53.14	168.6	
std. state	aq	-78.2	-30.5	288.7	
TlCl	c	-204.10	-184.93	111.30	50.92
std. state	aq	-161.80	-163.64	182.00	
TlCl ₃	c	-315.1			
std. state	aq	-305.0	-179.1	-23.0	
TlClO ₃	aq	-93.7	-35.6	287.9	

TABLE 6.3 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of the Elements and Inorganic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ · mol ⁻¹	$\Delta_f G^\circ$ kJ · mol ⁻¹	S° J · deg ⁻¹ · mol ⁻¹	C_p° J · deg ⁻¹ · mol ⁻¹
Tl ₂ CO ₃	c	-700	-614.6	155.2	
TlF	c	-324.6		83.3	54.77
std. state	aq	-327.27	-311.21	111.7	
TlI	c	-123.9	-125.39	127.6	52.51
std. state	aq	-49.83	-83.97	236.8	
TlNO ₃	c	-243.93	-152.46	160.7	99.50
	aq	-202.0	-143.7	272.0	
Tl ₂ O	c	-178.7	-147.3	126	
TlOH	c	-238.9	-195.8	88	
std. state	aq	-224.64	-189.66	114.6	
Tl ₂ S	c	-97.1	-93.7	151.0	
Tl ₂ Se	c	-59.0	-59.0	172.0	
Tl ₂ SO ₄	c	-931.8	-830.48	230.5	
std. state	aq	-898.56	-809.40	271.1	
Thorium					
Th	c	0	0	51.8(5)	27.32
	g	602.(6)		190.17(5)	
Th ⁴⁺ std. state	aq	-769.0	-705.1	-422.6	
ThBr ₄	c	-965.3	-927.2	230	
ThC _{1.94}	c	-146	-147.7	68.49	56.69
ThCl ₄	c	-1186.2	-1094.1	190.4	120.3
ThF ₃	g	-1166.1	-1160.6	339.2	73.3
ThF ₄	c	-2097.8	-2003.4	142.05	110.7
undissoc; std. state	aq	-2115.0	-1947.2	-105	
ThH ₂	c	-139.8	-100.0	50.71	36.69
ThI ₄	c	-664.8	-655.2	255	
ThN	c	-391.2	-363.6	56.07	45.2
Th ₃ N ₄	c	-1315.0	-1212.9	201	155.90
Th(NO ₃) ₄	c	-1441.4			
ThO ₂	c	-1226.4(35)	-1169.20	65.23(20)	61.76
ThOCl ₂	c	-1232.2	-1156.0	123.4	91.25
ThOF ₂	c	-1665.2	-1589.5	105	
Th(OH) ³⁺	aq	-1030.1	-920.5	-343.0	
Th(OH) ₂ ²⁺	aq	-1282.4	-1140.9	-218.0	
Th ₃ P ₄	c	-1140.2	-1112.9	221.8	
ThS ₂	c	-626.3	-620.1	96.2	
Th ₂ S ₃	c	-1083.7	-1077.0	180	
Th(SO ₄) ₂	c	-2542.6	-2310.4	159.0	173.47
Thulium					
Tm	c	0	0	74.01	27.03
Tm ³⁺ std. state	aq	-697.9	-661.9	-243.0	25.0
TmCl ₃	c	-986.6			
std. state	aq	-1199.1	-1055.6	-75.0	-385.0
Tm ₂ O ₃	c	-1888.7	-1794.5	139.8	116.7
Tin					
Sn white	c	0	0	51.08(8)	26.99
	aq	301.2(15)		168.492(4)	
gray	c	-2.09	0.13	44.14	25.77
Sn ²⁺ in aqueous HCl	aq	-8.9(10)	-27.2	-16.7(40)	
Sn ⁴⁺ in aqueous HCl	aq	30.5	2.5	-117	
SnBr ₂	c	-243.5			

TABLE 6.3 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of the Elements and Inorganic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ · mol ⁻¹	$\Delta_f G^\circ$ kJ · mol ⁻¹	S° J · deg ⁻¹ · mol ⁻¹	C_p° J · deg ⁻¹ · mol ⁻¹
SnBr ₄	c	-377.4	-350.2	264.4	136.44
	g	-314.6	-331.4	411.9	103.4
SnCl ₂	c	-325.1		130	79.33
std. state	aq	-329.7	-299.6	172	
SnCl ₄	lq	-511.3	-440.2	258.6	165.3
	g	-471.5	-432.2	365.8	98.3
SnH ₄	g	162.8	188.3	227.7	48.95
SnI ₂	c	-143.5			
SnI ₄	g			446.1	105.4
SnO tetragonal	c	-280.71(20)	-251.9	57.17(30)	44.31
SnO ₂ tetragonal	c	-577.63(20)	-515.8	49.04(10)	52.59
Sn(OH) ⁺	aq	-286.2	-254.8	50.0	
Sn(OH) ₂	c	-561.1	-491.6	155.0	
SnS	c	-100	-98.3	77.0	49.25
SnS ₂	c	-167.4		87.4	70.12
Titanium					
Ti	c	0	0	30.72(10)	25.0
	g	473.(3)		180.298(10)	
TiB	c	-160	-160	35	29.7
TiB ₂	c	-280	-275	28.5	44.3
TiBr ₂	c	-402	-383	108	78.7
TiBr ₃	c	-548.5	-523.8	176.6	101.7
TiBr ₄	c	-616.7	-589.5	243.5	131.5
TiC	c	-184	-180	24.2	33.81
TiCl ₂	c	-513.8	-464.4	87.4	69.8
TiCl ₃	c	-720.9	-653.5	139.7	97.2
TiCl ₄	lq	-804.2	-737.2	252.3	145.2
	g	-763.2(30)	-726.3	353.2(40)	95.4
TiF ₃	c	-1435	-1362	88	92
TiF ₄	c	-1649	-1559	133.96	114.27
TiH ₂	c	-144	-105.1	29.71	30.09
TiI ₄	c	-375	-371.5	249.4	125.6
TiN	c	-265.8	-243.8	52.73	37.08
TiO	c	-519.7	-495.0	50.0	39.9
TiO ₂	c	-944.0(8)	-888.8	50.62(30)	55.0
Ti ₂ O ₃	c	-1520.9	-1434.2	78.8	97.4
Ti ₃ O ₅	c	-2459.4	-2317.4	129.3	154.8
Tungsten					
W	c	0	0	32.6	24.3
WBr ₅	c	-312	-270	272	155
WBr ₆	c	-348.5	-290.8	314	181.4
W(CO) ₆	c	-953.5		331.8	242.5
WCl ₄	c	-443	-360	198.3	129.7
WCl ₅	c	-515	-402	217.6	155.6
WCl ₆	c	-602.5	-456	238.5	175.4
WF ₆	lq	-1747.7	-1631.4	251.5	
	g	-1721.7	-1631.4	341.1	119.0
WO ₂	c	-589.9	-533.86	50.5	56.1
WO ₃	c	-842.9	-764.1	75.9	73.8
WO ₄ ²⁻	aq	-1075.7			
WOCl ₄	c	-671	-549	173	146

TABLE 6.3 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of the Elements and Inorganic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ · mol ⁻¹	$\Delta_f G^\circ$ kJ · mol ⁻¹	S° J · deg ⁻¹ · mol ⁻¹	C_p° J · deg ⁻¹ · mol ⁻¹
WOF ₄	c	-1407	-1298	176.0	133.6
WO ₂ Cl ₂	c	-780	-703	200.8	104.4
Uranium					
U	c	0	0	50.20(20)	27.66
	g	533.(8)		199.79(10)	
U ³⁺	aq	-489.1	-476.2	-188.0	
U ⁴⁺	aq	-591.2	-531.9	-410.0	
UB ₂	c	-161.6	-159.4	55.52	55.77
UBr ₃	c	-699.2	-673.6	192	108.8
UBr ₄	c	-802.5	-767.8	238.0	128.0
UBr ₅	c	-810.9	-769.9	293	160.7
UC	c	-98.3	-99.2	59.20	50.12
UCl ₃	c	-866.5	-799.1	159.0	102.5
UCl ₄	c	-1019.2	-930.1	197.1	122.0
	aq	-1259.8	-1056.8	-184.0	
UCl ₅	c	-1058	-950	242.7	144.6
UCl ₆	c	-1092	-962	285.8	175.7
UF ₃	c	-1502.1	-1433.4	123.43	95.10
UF ₄	c	-1921.2	-1823.3	151.67	116.02
UF ₅	c	-2075.3	-1958.6	199.6	132.3
UF ₆	c	-2197.0	-2068.6	227.6	166.8
UH ₃	c	-127.2	-72.8	63.68	49.29
UI ₃	c	-460.7	-459.8	222	112.1
UI ₄	c	-512.1	-506.7	264	134.3
UN	c	-290.8	-265.7	62.43	47.57
UO ₂	c	-1085.0(10)	-1031.8	77.03(20)	63.60
UO ₂ ²⁺ std. state	aq	-1019.0(15)	-953.5	-98.2(30)	
UO ₃ gamma	c	-1223.8(12)	-1145.7	96.11(40)	81.67
U ₃ O ₇	c	-3427.1	-3242.9	250.5	215.5
U ₃ O ₈	c	-3574.8(25)	-3369.8	282.55(50)	238.36
U ₄ O ₉	c	-4510.4	-4275.1	334.1	293.3
UOBr ₂	c	-973.6	-929.7	158.00	98.00
UOCl ₂	c	-1066.9	-996.2	138.32	95.06
UOF ₂	c	-1499.1	-1428.8	119.2	
UO ₂ (OAc) ₂	c	-1963.55			
UO ₂ Br ₂	c	-1137.6	-1066.5	169.5	
UO ₂ Cl ₂	c	-1243.9	-1146.4	150.5	107.86
std. state	aq	-1353.9	-1215.9	15.5	
UO ₂ CO ₃	c	-1691.2	-1562.7	138	
std. state	aq	-1696.6	-1481.6	-154.4	
UO ₂ C ₂ O ₄	c	-1796.94			
UO ₂ F ₂	c	-1653.5	-1557.4	135.56	103.22
std. state	aq	-1684.0	-1551.3	-125.1	
UO ₂ (NO ₃) ₂	c	-1349.3	-1105.0	243	
std. state	aq	-1434.3	-1176.1	195.4	
UO ₂ (OH) ₂ std. state	aq	-1479.5	-1267.8	-118.8	
UO ₂ SO ₄	c	-1845.1	-1683.6	154.8	145.2
std. state	aq	-1928.8	-1698.3	-77.4	
US ₂	c	-527	-526.4	110.42	74.64
US ₃	c	-549.4	-547.3	138.49	95.60

TABLE 6.3 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of the Elements and Inorganic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ · mol ⁻¹	$\Delta_f G^\circ$ kJ · mol ⁻¹	S° J · deg ⁻¹ · mol ⁻¹	C_p° J · deg ⁻¹ · mol ⁻¹
Vanadium					
V	c	0	0	28.94	24.90
VBr ₄	g	-336.8			
VCl ₂	c	-452	-406	97.1	72.22
VCl ₃	c	-580.7	-511.3	131.0	93.18
VCl ₄	lq	-569.4	-503.8	255.0	161.7
VF ₅	lq	-1480.3	-1373.2	175.7	
	g	-1433.9	-1369.8	320.9	98.58
VN	c	-217.15	-191.08	37.28	38.00
VO	c	-431.8	-404.2	39.0	45.5
VO ₂	c	-717.6		51.5	62.59
VO ₂ ⁺ std. state	aq	-649.8	-587.0	-42.3	
VO ₂ ²⁺ std. state	aq	-486.6	-446.4	-133.9	
VO ₃ ⁻ std. state	aq	-888.3	-783.7	50.2	
V ₂ O ₃	c	-1218.8	-1139.3	98.3	103.2
V ₂ O ₄	c	-1427	-1318.4	103	115.4
V ₂ O ₅	c	-1550	-1419.3	130	130.6
V ₃ O ₅	c	-1933	-1803	163	
VOCl ₃	lq	-734.7	-668.6	244.4	150.62
	g	-695.6	-659.3	344.4	89.9
VOSO ₄	c	-1309.2	-1169.9	108.8	
Xenon					
Xe	g	0	0	169.685(3)	20.786
XeF ₂	c	-164.0			
XeF ₄	c	-261.5	-123.0		
XeF ₆	c	-360			
	g	-297			
XeO ₃	c	402			
XeOF ₄	lq	146			
Ytterbium					
Yb	c	0	0	59.87	26.74
Yb ²⁺ std. state	aq		-527.0		
Yb ³⁺ std. state	aq	-674.5	-643.9	238.0	25.0
Yb(OAc) ₃ undissoc; std. state	aq	-2105.0	-1772.84	183.3	
YbCl ₂	c	-799.6			
YbCl ₃	c	-959.8			
std. state	aq	-1176.1	-1037.6	-71.0	-385.0
Yb(NO ₃) ₃ std. state	aq	-1296.6			
Yb ₂ O ₃	c	-1814.6	-1726.7	133.1	115.35
Yttrium					
Y	c	0	0	44.4	26.51
Y ³⁺ std. state	aq	-723.4	-693.7	-251.0	
YCl ₃	c	-1000		136.8	75.0
YF ₃	c	-1718.8	-1644.7	100	
Y ₂ O ₃	c	-1905.31	-1816.65	99.08	102.51
Y(OH) ₃	c	-1435	-1291	99.2	
Zinc					
Zn	c	0	0	41.63(15)	25.40
	g	130.40(40)		160.990(4)	
Zn ²⁺ std. state	aq	-153.39(20)	-147.1	-109.8(5)	46.0

TABLE 6.3 Enthalpies and Gibbs Energies of Formation, Entropies, and Heat Capacities of the Elements and Inorganic Compounds (*Continued*)

Substance	Physical State	$\Delta_f H^\circ$ kJ · mol ⁻¹	$\Delta_f G^\circ$ kJ · mol ⁻¹	S° J · deg ⁻¹ · mol ⁻¹	C_p° J · deg ⁻¹ · mol ⁻¹
ZnBr ₂	c	-328.65	-312.13	138.5	65.7
std. state	aq	-396.98	-354.97	52.72	-238.0
ZnCl ₂	c	-415.05	-369.45	111.46	71.34
std. state	aq	-488.19	-409.53	0.84	-226.0
Zn(CN) ₄ ²⁻ std. state	aq	342.3	446.9	226	
ZnCO ₃	c	-812.78	-731.57	82.4	79.71
ZnF ₂	c	-764.4	-713.3	73.68	65.7
std. state	aq	-819.14	-704.67	-139.8	-167.0
ZnI ₂	c	-208.03	-208.95	161.1	65.69
	aq	-264.3	-250.2	110.5	-238.0
Zn(NO ₃) ₂	c	-483.7			
	aq	-568.6	-369.6	180.7	-126.0
ZnO	c	-350.46(27)	-320.52	43.65(40)	40.25
Zn(OH) ₂	c	-641.91	-553.59	81.2	
std. state	aq	-613.88	-461.62	-133.5	-251
ZnS sphalerite	c	-205.98	-201.29	57.7	46.02
wurtzite	c	-192.6			
ZnSe	c	-163	-163	84.0	
ZnSO ₄	c	-982.84	-871.5	110.5	99.2
	aq	-1063.2	-891.6	-92.0	-247.0
Zn ₂ SiO ₄	c	-1636.7	-1523.2	131.42	123.3
Zirconium					
Zr	c	0	0	39.0	25.40
ZrB	c	-322	-318.2	35.94	48.24
ZrBr ₂	c	-405	-382	116	86.7
ZrBr ₄	c	-760.7	-725.3	224	124.8
ZrC	c	197	-193	33.32	37.90
ZrCl ₂	c	-502.0	-386	110	72.6
ZrCl ₃	c	-714	-646	146	96
ZrCl ₄	c	-981	-890	181.4	119.8
ZrF ₂	c	-962	-913	75	66
ZrF ₄	c	-1911.3	-1810.0	104.7	103.6
ZnH ₂	c	-169.0	-128.8	35.0	31.0
ZrI ₂	c	-259	-258	150.2	94.1
ZrI ₃	c	-397.5	-394.9	204.6	103.8
ZrI ₄	c	-488	-485.4	260	127.8
ZrN	c	-365	-336.7	38.86	40.44
ZrO ₂	c	-1100.6	-1042.8	50.36	56.19
ZrSiO ₄	c	-2033.4	-1919.1	84.1	98.7
ZrSO ₄	c	-2217.1			172.0

TABLE 6.4 Heats of Fusion, Vaporization, and Sublimation and Specific Heat at Various Temperatures of the Elements and Inorganic Compounds*Abbreviations Used in the Table* ΔH_m , enthalpy of melting (at the melting point) in $\text{kJ} \cdot \text{mol}^{-1}$ ΔH_v , enthalpy of vaporization (at the boiling point) in $\text{kJ} \cdot \text{mol}^{-1}$ ΔH_s , enthalpy of sublimation (or vaporization at 298 K) in $\text{kJ} \cdot \text{mol}^{-1}$ C_p , specific heat (at temperature specified on the Kelvin scale) for the physical state in existence (or specified: c, lq, g) at that temperature in $\text{J} \cdot \text{K}^{-1} \cdot \text{mol}^{-1}$ ΔH_t , enthalpy of transition (at temperature specified, superscript, measured in degrees Celsius) in $\text{kJ} \cdot \text{mol}^{-1}$

Substance	ΔH_m	ΔH_v	ΔH_s	C_p			
				400 K	600 K	800 K	1000 K
Aluminum							
Al	10.71	294.0	326.4	25.8	27.9	30.6	34.9(lq)
Al(BH ₄) ₃		30					
Al ₆ BeO ₁₀	402			324.3	380.6	407.8	425.2
AlBr ₃	11.25	23.5		125.0	125.0	125.0	125.0
Al ₄ C ₃				138.5	159.2	169.7	176.1
AlCl ₃	35.4		116	100.1	117.7	135.2	152.8
AlF ₃ , $\Delta H_t = 0.56^{455}$	98			86.3	97.3	98.5	100.8
AlI ₃	15.9	32.2	112	108.5	121.3		
AlN				36.7	43.5	46.8	48.5
Al ₂ O ₃ corundum	111.4			96.1	112.5	120.1	124.8
AlOCl				64.3	72.6	76.9	79.3
Al ₂ SiO ₅ andalusite				149.6	174.5	186.1	194.0
kyanite				148.3	176.2	188.3	196.2
sillimanite				147.5	173.0	185.0	193.5
Al ₆ Si ₂ O ₁₃ mullite				390.7	459.8	494.1	513.4
Al ₂ S ₃	55			115.0	124.1	129.7	134.0
Al ₂ TiO ₅				162.0	182.8	192.9	200.0
Americium							
Am	14.39						
Ammonium							
NH ₃	5.66	23.35	19.86	38.7	45.3	51.1	56.2
ND ₃ ammonia-d ₃				42.9	51.5	58.6	64.3
NH ₄ Br, $\Delta H_t = 3.22^{138}$							
NH ₄ Cl, $\Delta H_t = 1.046^{-30.6}$				103			
$\Delta H_t = 3.950^{184.6}$							
NH ₄ ClO ₄				148.7			
NH ₄ I, $\Delta H_t = 2.93^{-13}$	20.9		168.5 ⁵²⁵	89.0	103.3	117.7	
NH ₄ NO ₃	6.40						
Antimony							
Sb	19.87	193.43		25.9	27.7	29.5	31.4
SbBr ₃	14.6	59		125.5(lq)	81.6(g)	82.2	82.5
SbCl ₃	12.7	45.2		123.4(lq)	81.6(g)	82.2	82.5
SbCl ₅	10.0	48.4					
SbH ₃		21.3					
SbI ₃	22.8	68.6		106.6(lq)	143.5(lq)	82.2(g)	82.5(g)
Sb ₂ O ₃ , $\Delta H_t = 7.1^{573}$	54.4	74.6		108.5	122.8	137.1	150.6
Sb ₂ S ₃				123.3	134.4	145.4	
Argon							
Ar	1.12	6.43		20.8	20.8	20.8	20.8

TABLE 6.4 Heats of Fusion, Vaporization, and Sublimation and Specific Heat at Various Temperatures of the Elements and Inorganic Compounds (*Continued*)

Substance	ΔH_m	ΔH_v	ΔH_s	C_p			
				400 K	600 K	800 K	1000 K
Arsenic							
As	24.44			25.6	27.5	29.3	
AsBr ₃	11.7	41.8					
AsCl ₃	10.1	35.0		133.5(lq)	88.3(g)	88.3	
AsF ₃	10.4	29.7					
AsF ₅		20.8					
AsH ₃		16.7		45.4	53.2	58.8	63.9
AsI ₃		59.3					
As ₂ O ₃	18.4			116.4			
Barium							
Ba	7.12	140.3		33.2	33.9(c)		39.1(lq)
BaBr ₂	32.2			79.2	83.5	87.9	92.2
BaCl ₂ , $\Delta H_t = 16.9^{925}$	15.85	246.4		77.3	80.4	84.3	89.5
BaCO ₃ , $\Delta H_t = 18.8^{806}$	40			99.0	113.0	124.2	134.6
BaF ₂ , $\Delta H_t = 2.67^{1207}$	17.8	285.4	405.1	75.9	80.3	84.9	94.6
BaH ₂	25						
BaI ₂	26.5	43.9	302.5	79.5	83.5	87.5(c)	113.0(lq)
BaMoO ₄				129.5	143.5	152.2	159.3
BaO	46	330.6	424.3	49.9	53.2	55.4	57.1
Ba(OH) ₂	16			112.6	122.7(c)	141.0(lq)	
BaS	63						
BaSO ₄	40			119.4	131.6	135.9	137.9
BaTiO ₃ , $\Delta H_t = 0.067^{75}$				111.5	121.8	126.1	128.7
Beryllium							
Be	7.895	297	291	20.0	23.3	25.5	27.3
BeAl ₂ O ₄ , chrysoberyl	170.0			130.3	155.0	166.8	174.2
BeBr ₂	18	100.0	515	70.6	77.6(c)	113.0(lq)	113.0
Be ₂ C	75.3			47.6	51.9	64.7	73.2
BeCl ₂ , $\Delta H_t = 6.8^{403}$	8.66	105	136.0	68.7	75.8(c)	121.4(lq)	121.4
BeF ₂ , $\Delta H_t = 0.92^{227}$	4.77	199.4		62.5	67.5	74.1(c)	85.6(lq)
BeI ₂	18	70.5	125	76.9	84.2		
Be ₃ N ₂	129.3			84.4	106.5	117.6	123.6
BeO, $\Delta H_t = 6.7^{2100}$	86			33.8	42.4	46.7	49.3
BeS				120.8	149.2	166.0	174.1
Be ₂ SiO ₄				103.9	126.8	149.8	174.4
BeSO ₄ , $\Delta H_t = 1.113^{590}$ $\Delta H_t = 19.55^{635}$	6			103.9	126.8	149.8	174.4
BeWO ₄				113.0	131.3	142.9	153.0
Bismuth							
Bi	11.30	151		27.0(c)	31.8(lq)	31.8	31.8
BiBr ₃	21.7	75.4					
BiCl ₃	10.9	72.6					
BiI ₃		20.9					
Bi ₂ O ₃ , $\Delta H_t = 116.7^{717}$	28.5			116.9	123.6	130.3	137.0
Bi ₂ S ₃				131.1	136.2	141.3	146.4
Bi ₂ Te ₃	120.5			164.3	179.7	192.3	
Boron							
B	50.2	480	552	15.7	20.8	23.4	25.0
BBr ₃		30.5		72.6(g)	77.6	79.8	81.1
B ₄ C	105			76.4	98.4	107.7	114.3

TABLE 6.4 Heats of Fusion, Vaporization, and Sublimation and Specific Heat at Various Temperatures of the Elements and Inorganic Compounds (*Continued*)

Substance	ΔH_m	ΔH_v	ΔH_s	C_p			
				400 K	600 K	800 K	1000 K
BCl ₃	2.10	23.8	23.1	68.4(g)	75.0	78.2	79.8
BF ₃	4.20	19.3	57.5	67.1	72.6	75.8	
F ₂ B-BF ₂		28					
BH ₃				38.9	45.4	52.3	58.4
B ₂ H ₆	4.44	14.3		74.3	101.3	121.7	136.4
B ₄ H ₉	6.13	28.4		130.2(g)	187.6	227.4	254.4
B ₄ H ₁₀		27.1					
B ₅ H ₁₁		31.8					
B ₁₀ H ₁₄	32.5	48.5	76.7	250.0(lq)	351.6(g)	417.2	460.4
BI ₃		40.5					
BN	81		728	26.3	35.2	40.5	44.3
B ₃ N ₃ H ₆ borazine		32.1		126.9	169.4	197.2	216.6
B ₂ O ₃	24.56	390.4		77.9	98.1(c)	129.7(lq)	129.7
B ₃ O ₃ H ₃ boroxin			44.8	120.1	162.8	194.6	214.2
Bromine							
Br ₂	10.57	29.96	30.9	36.7(g)	37.3	37.6	37.8
BrCl	10.4	34.7					
BrF		25.1					
BrF ₃	12.05	47.6		72.6	78.0	80.1	81.2
BrF ₅	5.67	30.6		113.0	123.2	127.3	129.3
Cadmium							
Cd	6.19	99.9		27.1(c)	29.7(lq)	29.7	29.7
CdBr ₂	20.9	115					
CdCl ₂	48.58	124.3		79.8	86.3	92.7	104.6
CdF ₂	22.6	214					
CdI ₂	15.3	115					
Cd(NO ₃) ₂ · 4H ₂ O	32.6						
CdO			225.1	43.8	45.6	47.3	49.1
CdS			209.6	55.5	56.2	57.0	57.7
CdSO ₄				108.3	123.8	139.2	154.7
Calcium							
Ca, $\Delta H_f = 0.93^4$	8.54	154.7		26.9	30.0	33.8	39.7
Ca(BO ₂) ₂	74.1			125.0	144.9	157.2	176.2
CaB ₄ O ₇	113.4			202.0	243.0	267.7	287.8
CaBr ₂	29.1	200	298.3	78.0	80.5	83.5	88.6
CaC ₂ carbide	32						
CaCl ₂	28.05	235		75.6	78.2	80.9	85.8
CaCN ₂ cyanamide	0.432						
CaCO ₃	36						
CaF ₂ , $\Delta H_f = 4.8^{1151}$	29.3	308.9	441	73.9	78.5	83.9	90.1
CaH ₂	6.7						
CaI ₂	41.8	179.4	243	79.2	83.1	87.1	91.0
Ca[Mg(CO ₃) ₂] dolomite				143.3	163.3	176.8	188.3
CaMoO ₄				131.3	144.9	153.5	150.6
Ca ₃ N ₂				122.2	140.8	159.2	
Ca(NO ₃) ₂	21.4			173.7	210.5	243.4	
CaO	79.5			46.6	50.5	52.4	53.7
Ca(OH) ₂ , $\Delta H_{dec} = 99.2$				98.4	107.4		
Ca ₃ (PO ₄) ₂ , $\Delta H_f = 15.5^{1100}$				255.1	295.6	331.3	365.7
CaS	70			49.2	51.5	53.0	54.1

TABLE 6.4 Heats of Fusion, Vaporization, and Sublimation and Specific Heat at Various Temperatures of the Elements and Inorganic Compounds (*Continued*)

Substance	ΔH_m	ΔH_v	ΔH_s	C_p			
				400 K	600 K	800 K	1000 K
CaSiO ₃ , $\Delta H_t = 7.1^{1190}$	56.1			100.4	113.0	119.2	123.8
Ca ₂ SiO ₄ , $\Delta H_t = 4.44^{675}$ $\Delta H_t = 3.26^{1420}$				146.4	162.8	179.2	184.0
3CaO · SiO ₂				196.4	218.4	230.8	240.4
CaSO ₄	28.0			109.7	129.5	149.2	169.0
CaSO ₄ · ½H ₂ O				147.4	167.2	186.9	206.7
CaSO ₄ · 2H ₂ O				260.7	280.3	300.0	319.8
CaTiO ₃ , $\Delta H_t = 2.30^{1257}$				112.3	123.1	127.7	130.4
Ca(VO ₂) ₂				182.9	206.7	230.5	254.4
CaWO ₄				127.6	140.2	147.3	152.8
Carbon							
C graphite	117			12.0	16.6	19.7	21.7
(CN) ₂ cyanogen	8.1	23.3	19.7	61.9(g)	68.2	72.9	76.4
CNBr			45.4	50.19(g)	53.7	56.2	58.1
CNCl	11.4			48.7	52.8	55.7	57.7
CNI			59.4	50.8	53.7	55.8	57.4
CO, $\Delta H_t = 0.632^{-211.6}$	0.837	6.04		29.3	30.4	31.9	33.2
CO ₂	9.02	15.8	25.2	41.3	47.3	51.4	54.3
C ₂ O ₃	5.40	26.9 ^{43.5}		75.0	85.5	92.7	97.7
COCl ₂	5.74	24.4		63.9	71.1	75.0	77.4
COF ₂		16.1		54.8	64.9	70.8	74.4
COS	7.73	18.6		45.9	51.3	54.7	57.0
CS ₂	4.40	26.7	27.5	49.7	54.6	57.4	59.3
Cerium							
Ce, $\Delta H_t = 3.01^{730}$	5.46	398	419	30.6	30.8	32.1	33.8
CeCl ₃	54.4	170.1	326				
CeI ₃	51.9						
CeO ₂				66.9	69.0	71.1	73.2
Cesium							
Cs	2.09	63.9	76.6	31.5	31.0	30.9(lq)	20.8(g)
CsBr	23.6	151		52.9	55.0	57.2(c)	77.4(lq)
CsCl, $\Delta H_t = 3.77^{470}$	15.9	115.1		54.7	59.1	63.7(c)	77.4(lq)
CsF	21.7	115.5		53.8	57.4	60.9(c)	74.1(lq)
CsI	23.9	150.2		51.9	57.8(c)	65.5(lq)	67.8
CsIO ₃	13.0						
CsOH, $\Delta H_t = 1.30^{137}$ $\Delta H_t = 6.1^{220}$	4.56	120		74.4(c)	81.6(lq)	81.6	81.6
Cs ₂ SO ₄ , $\Delta H_t = 4.3^{667}$	35.7		76.5	112.1	132.2	163.2	194.2
Chlorine							
Cl ₂	6.406	20.41	17.65	35.3	36.6	37.1	37.4
ClF		24		33.8	35.6	36.5	37.0
ClF ₃	7.61	27.5		70.6(g)	76.8	79.4	80.7
ClF ₅		22.9		110.0	121.6	126.3	128.6
ClO				33.2	35.3	36.3	36.9
ClO ₂		30		46.1	51.4	54.2	55.8
ClO ₃ F	3.83	19.33		75.9	89.2	96.1	100.0
Cl ₂ O		25.9		51.4	54.7	56.2	56.9
Cl ₂ O ₇		34.69					
Chromium							
Cr, $\Delta H_t = 0.0008^{38.5}$	21.0	339.5	397	25.2	27.7	29.4	31.9

TABLE 6.4 Heats of Fusion, Vaporization, and Sublimation and Specific Heat at Various Temperatures of the Elements and Inorganic Compounds (*Continued*)

Substance	ΔH_m	ΔH_v	ΔH_s	C_p			
				400 K	600 K	800 K	1000 K
CrCl ₂	32.2	196.7		72.6	77.0	81.5	85.9
CrCl ₃			237.7	93.1	99.0	104.9	110.7
Cr(CO) ₆			72.0	233.9			
CrN, $\Delta H_{dec} = 112$			49.1	50.4	51.7	53.0	
CrO ₂ Cl ₂		35.1					
CrO ₂ F ₂	23.4	34.3					
CrO ₃	15.77			63.9	72.5	76.7	78.8
Cr ₂ O ₃	129.7			112.7	120.5	124.3	127.0
Cr ₂ (SO ₄) ₃				316.9	345.2	373.5	401.8
Cobalt							
Co, $\Delta H_t = 0.452^{427}$	16.2	377	424	26.5	29.7	32.4	37.0
CoCl ₂	45	146	219	81.7	84.6	86.8	88.2
CoF ₂	59	202	315	75.7	80.8	82.9	84.2
CoF ₃				97	100	102	104
CoO				52.9	54.3	54.8	56.0
Co ₃ O ₄				143	163	185	210
CoSO ₄ , $\Delta H_t = 2.1^{691}$				119	141	152	158
Copper							
Cu	13.26	300.4	337.7	25.3	26.5	27.4	28.7
CuBr, $\Delta H_t = 5.86^{380}$ $\Delta H_t = 2.9^{465}$	9.6			56.5	59.8(c)	66.9(lq)	66.9
CuCl	10.2	54	241.8	56.9	61.5(c)	66.9(lq)	66.9
CuCl ₂ , $\Delta H_t = 0.700^{402}$ $\Delta H_t = 15.001^{598}$	20.4			76.3	80.2(c)	82.4(lq)	100.0
CuCN		12			66.7	73.1	78.0
CuF			268	55.5	59.6		
CuF ₂	55	156	261	72.4	81.9	87.0	90.4
CuI	10.9			55.4	57.8	60.2	66.9
CuO	11.8			46.8	50.8	53.2	55.0
Cu ₂ O	64.8			67.6	73.3	77.6	81.5
CuS				48.8	51.0	53.2	55.4
Cu ₂ S, $\Delta H_t = 3.85^{103}$ $\Delta H_t = 0.84^{350}$	10.9			97.3	97.3	85.0	85.0
Cu ₂ Se, $\Delta H_t = 4.85^{110}$				90.9	91.7	92.5	93.4
CuSO ₄				114.9	136.3	147.7	153.8
Dysprosium							
Dy	11.06	280	290.4				
Erbium							
Er	19.90	280	317.2				
Europium							
Eu	9.21	176	178				
Fluorine							
F ₂ , $\Delta H_t = 0.728^{-227.6}$	0.510	6.62		33.0	35.2	36.3	37.1
FNO ₃				75.1	87.8	94.8	98.9
Gadolinium							
Gd	10.05	301.3		36.6	35.5	34.5	33.5
Gd ₂ O ₃				113.4	120.1	124.4	127.9
Gallium							
Ga	5.59	254		27.1(lq)	26.7	26.6	26.6
GaBr ₃	12.1	38.9					

TABLE 6.4 Heats of Fusion, Vaporization, and Sublimation and Specific Heat at Various Temperatures of the Elements and Inorganic Compounds (*Continued*)

Substance	ΔH_m	ΔH_v	ΔH_s	C_p			
				400 K	600 K	800 K	1000 K
GaCl ₃	11.13	23.9					
GaI ₃	12.9	56.5					
Ga ₂ O ₃	100			91.4	112.5	133.5	
GaSb	25.1						
Germanium							
Ge, $\Delta H_f = 37.03^{938.3}$	36.94	334		24.3	25.4	26.2	26.9
GeBr ₄		41.4					
GeCl ₄		27.9		100.7	104.6	106.1	106.8
GeH ₄		14.1					
Ge ₂ H ₆		25.1					
Ge ₃ H ₈		32.2					
GeO ₂	43.9			61.39	69.1	72.4	75.0
Gold							
Au	12.55	324		25.8	26.8	27.8	28.8
AuSn	25.6			54.1	63.3(c)	60.6(lq)	
Hafnium							
Hf, $\Delta H_f = 5.9^{1750}$	27.2	571	618.4	26.7	28.6	30.3	31.9
HfCl ₄	75		99.6	125.4	105.8	106.7	107.1
HfO ₂ , $\Delta H_f = 10.5^{1700}$	104.6			67.7	73.9	77.3	79.9
Helium							
He	0.0138	0.0829		20.79	20.79	20.79	20.79
Holmium							
Ho	16.8	71		280	317		
Hydrogen							
H ₂	0.117	0.904		29.2	29.3	29.6	30.2
¹ H ² H				29.2	29.4	29.9	30.7
² H ₂				29.2	29.6	30.5	31.6
HBO ₂	14.3		242.1	61.5(c)			
H ₃ BO ₃	22.3						
HBr	2.406	17.61	12.7	29.2	29.8	31.1	32.3
HCl, $\Delta H_f = 1.188^{-174.77}$	1.992	16.14	9.1	19.2	29.2	29.6	31.6
² HCl				29.4	30.6	32.1	33.5
HCIO				40.0	44.0	46.6	48.5
HCN	8.406	25.22		39.4	44.2	47.9	51.0
HF	4.58			29.1	29.2	29.5	30.2
² HF				29.2	29.5	30.5	31.6
H ₂ F ₂ dimer				49.7	56.5	61.0	64.4
HFO				38.6	42.8	45.7	47.9
HI	2.87	19.77	17.4	29.3	30.3	31.8	33.1
HNCO isocyanic acid				50.6	58.3	63.5	67.5
HNCS isothiocyanic acid				53.2	61.0	65.9	69.3
HNO ₂ <i>cis</i>				51.4	59.9	65.4	69.2
<i>trans</i>				52.1	60.3	65.6	69.3
HNO ₃	10.47	39.46	39.1	63.1	76.8	85.0	90.4
HN ₃		30.5					
H ₂ O	6.009	40.66	44.0	34.3(g)	36.4	38.8	41.4
¹ H ² HO				34.8	37.5	40.4	43.3
² H ₂ O				35.6	38.8	42.2	45.4
H ₂ O ₂	12.50		51.63	48.5	55.7	59.8	66.7
² H ₂ O ₂	12.68		52.4				

TABLE 6.4 Heats of Fusion, Vaporization, and Sublimation and Specific Heat at Various Temperatures of the Elements and Inorganic Compounds (*Continued*)

Substance	ΔH_m	ΔH_v	ΔH_s	C_p			
				400 K	600 K	800 K	1000 K
HPH ₂ O ₂	9.67						
H ₃ PO ₃	12.84						
H ₃ PO ₄	13.4			175.7	236.0	296.2	365.5
H ₂ S, $\Delta H_t = 1.531^{-169.61}$	23.8	18.67	14.1	38.9	42.5	45.8	
H ₂ S ₂		33.8					
H ₂ Se		19.7					
HSO ₃ F				87.5	102.6	111.0	116.3
H ₂ SO ₄	10.71	50.2		158.2	197.0(lq)	125.9(g)	132.7
H ₂ SO ₄ · H ₂ O	19.46			228.5			
H ₂ SO ₄ · 2H ₂ O	18.24			294.6			
H ₂ SO ₄ · 3H ₂ O	24.0			347.8			
H ₂ SO ₄ · 4H ₂ O	30.64			410.3			
H ₂ Te		19.2					
Indium							
In	3.28	231.8	243.1	28.5(c)	30.1(lq)	30.1	30.1
InBr	15	92					
InBr ₃	26						
InCl	21.3						
InCl ₃	27						
InF ₃	64						
InI	17.3	90.8					
InI ₃	18.5						
In ₂ O ₃	105						
InSb	25.5						
Iodine							
I ₂	150.66	41.6	62.4	79.6(lq)	37.6(g)	37.9	38.1
ICl	11.60		52.9	98.3(lq)	90.0	81.6	73.2
IF				35.1	36.6	37.3	37.7
IF ₅		41.3		476.1(g)	516.7	533.0	541.4
IF ₇				152.0(g)	167.6	173.9	177.0
Iridium							
Ir	41.12	231.8	243.1	28.5(c)	30.1(lq)	30.1	30.1
IrF ₆	8.40	36					
IrO ₂				63.8	76.5	89.2	102.0
Iron							
Fe, $\Delta H_t = 0.90^{911}$ $\Delta H_t = 0.837^{1392}$	13.81	340	415.5	27.4	32.1	38.0	54.4
FeBr ₂	50.2						
FeBr ₃ , $\Delta H_t = 0.418^{377}$	50.2		207.5	83.0	87.0	91.4	95.9
Fe ₂ C, $\Delta H_t = 0.75^{190}$	51.5			115.7	114.7	117.2	119.8
FeCl ₂	43.01	26.3		79.7	83.1	85.5	101.2
FeCl ₃	43.1	43.76		106.7(c)	133.9(lq)	82.3(g)	81.5
FeCO ₃				93.5	115.9	138.3	
Fe(CO) ₅	13.23	33.72		189.0	209.8	223.1	232.2
FeCr ₂ O ₄				152.0	167.7	175.9	182.2
FeF ₂	51.9	224.4	316	72.0	77.1	80.3	82.1
FeF ₃			274	96.4	96.8	99.3	101.8
FeI ₂ , $\Delta H_t = 0.8^{377}$	45	104.6	192	83.9	84.4	110.9	113.0(lq)
Fe ₃ N				72.6	77.7	82.8	87.9
FeO	24.06			51.8	54.9	57.3	59.4

TABLE 6.4 Heats of Fusion, Vaporization, and Sublimation and Specific Heat at Various Temperatures of the Elements and Inorganic Compounds (*Continued*)

Substance	ΔH_m	ΔH_v	ΔH_s	C_p			
				400 K	600 K	800 K	1000 K
Fe ₂ O ₃ , $\Delta H_f = 0.67^{677}$				120.1	141.2	158.2	150.6
Fe ₃ O ₄	138.1			171.1	212.5	252.9	
Fe(OH) ₂			243.5	102.1	111.3	118.9	123.4
Fe(OH) ₃				118.0	140.6	154.8	164.9
FeS, $\Delta H_f = 0.40^{138}$	31.5			89.2	62.0	58.6	59.0
$\Delta H_f = 0.095^{325}$							
FeS ₂ marcasite				69.2	74.6	78.7	82.8
pyrite				68.9	74.3	78.3	82.5
FeSiO ₃				100.8	114.3	124.5	133.9
Fe ₂ SiO ₄	92			150.9	168.5	179.7	189.1
FeSO ₄				116.7	138.0	149.4	
Fe ₂ (SO ₄) ₃				307.0	363.3	393.3	409.2
FeTiO ₃ ilmenite	90.8	111.4	122.0	128.1	132.8		
Krypton							
Kr	1.37	9.08					
Lanthanum							
La, $\Delta H_f = 2.85^{868}$	6.20	402.1		28.5	29.8	31.2	32.5
LaCl ₃	43.1	192.1		105.8	110.1	114.3	118.7
La ₂ O ₃				117.3	124.7	128.9	132.3
Lead							
Pb	4.77	179.5	195.2	27.7	29.4	30.0	29.4
Pb(BO ₂) ₂				129.7	162.3		
PbB ₄ O ₇				207	265	305	330
PbBr ₂	16.44	133	173	81.3	88.8	112.1(lq)	112.1
Pb(CH ₃) ₄	10.86						
Pb(C ₂ H ₅) ₄	8.80						
PbCl ₂	21.9	127	185.3	80.1	85.9	111.5(lq)	111.5
PbCO ₃				99.7	123.6	147.6	
PbF ₂ , $\Delta H_f = 1.46^{310}$	14.7	157		76.1	82.5	89.1	95.6
PbI ₂	23.4	104	172	78.9	83.7(c)	108.6(lq)	108.6
PbMoO ₄				135.3	148.9	159.0	168.2
PbO, $\Delta H_f = 0.17^{488}$	25.5	207		50.4	55.4	55.0	57.8
PbO ₂				67.6			
Pb ₃ O ₄				173.1	190.8	199.2	
PbS	18.8	230		50.5	52.4	54.3	56.2
PbSiO ₃	26.0			101.5	113.5	125.6	138.4
Pb ₂ SiO ₄	51.0			152.0	173.3	184.2	189.1
PbSO ₄ , $\Delta H_f = 17.2^{866}$	40.2			108.7	128.6	152.4	177.3
PbSO ₄ · PbO				157.3	182.5	211.7	242.0
Lithium							
Li	3.00	147.1	159.3	27.6(c)	29.5(lq)	28.9	28.8
Li ₂ AlF ₆ , $\Delta H_f = 9.5^{562}$	110.5			236.4	262.8	290.8	318.6
LiAlO ₂	87			81.5	92.7	98.2	102.0
LiBH ₄				91.0			
LiBeF ₃	27.2			104.6	129.7(c)	159.0(lq)	159.0
Li ₂ BeF ₄	44.0			150.5	180.2(c)	232.1(lq)	232.1
LiBO ₂	33.8	265		81.1	85.1	96.9	108.3
Li ₂ B ₄ O ₇	121			197.6	241.1	274.4	300.2
LiBr	17.6	107.1		51.3	56.1	64.5(c)	65.3(lq)
LiCl	19.9			51.0	55.6	65.8	

TABLE 6.4 Heats of Fusion, Vaporization, and Sublimation and Specific Heat at Various Temperatures of the Elements and Inorganic Compounds (*Continued*)

Substance	ΔH_m	ΔH_v	ΔH_s	C_p			
				400 K	600 K	800 K	1000 K
LiClO ₄	29			130.0(c)	161.0(lq)	161	161
Li ₂ CO ₃ , $\Delta H_t = 0.561^{350}$ $\Delta H_t = 2.238^{410}$	41			112.2	149.4	159.0	
LiF	27.09	146.8	276.1	46.5	51.6	55.7	59.6
LiH	22.6		231.3	34.8	46.4	57.3	
LiI	14.6						
LiIO ₃ , $\Delta H_t = 2.22^{260}$							
Li ₃ N				87.1	106.4	124.4	141.0
LiNO ₃	24.9						
Li ₂ O	58.6			64.0	73.8	80.6	86.2
Li ₂ O ₂				82.7(c)	80.2(g)	81.4	82.1
LiOH	20.88	187.9	250.6	58.0	68.2(c)	87.1(lq)	87.1
Li ₂ SiO ₃	28.0			118.8	134.3	144.4	152.3
Li ₂ Si ₂ O ₅ , $\Delta H_t = 0.941^{936}$	53.8			174.9	205.7	222.6	235.4
Li ₂ SO ₄ , $\Delta H_t = 28.5^{575}$	7.50			139.2	168.5	196.1	223.4
Li ₂ TiO ₃ , $\Delta H_t = 11.51^{1212}$	110.7			127.4	141.5	149.0	153.9
Lutetium							
Lu	(22)	414					
Magnesium							
Mg	8.48	128	147	26.1	28.2	30.5	
MgAl ₂ O ₄	192			138.0	157.9	169.5	178.7
MgBr ₂	39.3	149	222	77.3	81.4	84.5	
MgCl ₂	43.1	156.2	249.2	75.7	79.9	82.5	
MgCO ₃	59			89.9	109.0	122.3	131.8
MgF ₂	58.5	274.1	399.5	68.5	75.3	78.6	80.5
MgH ₂	14						
MgI ₂	26		206	78.4	83.0	96.3(c)	100.4(lq)
Mg ₃ N ₂ , $\Delta H_t = 0.46^{550}$ $\Delta H_t = 0.92^{788}$			107.6	113.8	119.9	123.8	
Mg(NO ₃) ₂				168.5	225.5		
MgO	77			42.6	47.4	49.7	51.2
Mg(OH) ₂				91.7			
Mg ₃ (PO ₄) ₂	121			240.2	282.2	320.6	351.5
MgS	63						
Mg ₂ Si	85.8			73.8	79.8	83.9	87.4
MgSiO ₃ , $\Delta H_t = 0.67^{630}$ $\Delta H_t = 1.63^{985}$	71			94.2	107.0	115.8	120.3
Mg ₂ SiO ₄				137.6	156.4	167.1	174.6
MgSO ₄	14.6			110.0	127.6	140.5	151.7
MgTiO ₃				105.2	118.5	125.4	129.9
Mg ₂ TiO ₄				146	164	175	184
MgWO ₄				123.4	137.0	146.1	154.8
Manganese							
Mn, $\Delta H_t = 2.23^{727}$ $\Delta H_t = 2.12^{1101}$ $\Delta H_t = 1.88^{1137}$	12.9	221		28.5	31.9	34.9	37.5
MnBr ₂	33	113		77.8	82.8	87.7	
Mn ₃ C, $\Delta H_t = 14.94^{1037}$				104.4	115.0	121.7	127.4
MnCl ₂	30.7	149.0		77.2	81.8	85.1	96.2(lq)
Mn ₂ (CO) ₁₀			62.8				

TABLE 6.4 Heats of Fusion, Vaporization, and Sublimation and Specific Heat at Various Temperatures of the Elements and Inorganic Compounds (*Continued*)

Substance	ΔH_m	ΔH_v	ΔH_s	C_p			
				400 K	600 K	800 K	1000 K
MnF ₂	23.0			70.6	75.7	80.7	85.9
MnI ₂	42			78.1	83.6	89.0	108.8
MnO	54.4			47.5	50.3	52.4	54.2
MnO ₂				63.4	71.1	75.1	
Mn ₂ O ₃				109.0	120.8	129.4	137.2
Mn ₃ O ₄ , $\Delta H_t = 20.79^{1172}$				157.3	169.5	179.7	189.3
MnS	26.4			50.7	52.2	53.7	55.2
MnSiO ₃	66.9			100.9	113.1	119.5	124.2
MnSO ₄				119.0	136.7	147.7	
MnTiO ₃				111.7	121.2	125.7	128.8
Mercury							
Hg	2.29	59.1	61.4	27.4	27.1(lq)	20.8(g)	20.8
HgBr ₂	17.9	58.9		78.3	102.1(lq)	102.1	102.1
Hg ₂ Br ₂				109.6	115.6		
HgCl ₂	19.41	58.9		77.0(c)	102.9(lq)		
Hg ₂ Cl ₂				106.0	112.1		
HgF ₂	23.0	92		77.0	81.2	85.4(c)	102.9(lq)
Hg ₂ F ₂				104.7	111.7	116.9	
HgI ₂ , $\Delta H_t = 2.52^{129}$	18.9	59.2		82.0(c)	84.1(lq)	62.2(g)	62.2
Hg ₂ I ₂	27.8			110.4(c)	136.4(lq)		
HgO				48.3	54.1		
HgS, $\Delta H_t = 4.2^{386}$				48.0	51.0	54.1	
Molybdenum							
Mo	37.48	617	664	25.1	26.5	27.4	28.4
MoBr ₃				106.9	109.8	112.7	
MoCl ₄	17	61.5		135.0(c)	146.4(lq)		
MoCl ₅	18.8	62.8		167.4(c)	175.7(lq)	175.7	175.7
Mo(CO) ₆		72.5	69.9				
MoF ₆ , $\Delta H_t = 8.17^{-9.65}$	4.33	27.2	28.0	133.1	145.3	150.4	153.0
MoO ₂				63.5	71.2	76.5	81.4
MoO ₃	48	138		83.1	91.8	100.0	109.0
MoS ₂				68.9	73.6	76.2	78.2
Mo ₂ S ₃	130			117.5	127.4	135.2	142.3
Neodymium							
Nd, $\Delta H_t = 2.98^{862}$	7.14	289		28.2	32.1	36.9	42.0
Nd ₂ O ₃				120.3	130.0	137.7	144.4
Neon							
Ne	0.335	1.71					
Neptunium							
Np, $\Delta H_t = 8.37^{280}$	3.20	336		34.8			
Nickel							
Ni	17.48	377.5		28.5	30.0	31.0	32.2
NiCl ₂	71.2		231.0	76.3	79.9	80.9	
Ni(CO) ₄	13.8	29.3		160.4(g)	173.2	182.1	188.6
NiF ₂				76.4	78.5	82.6	
NiO				52.2	51.8	53.6	55.2
NiS, $\Delta H_t = 6.4^{379}$	30.1			12.1	13.2	13.7	15.1
Ni ₃ S ₂ , $\Delta H_t = 56.2^{556}$	19.7			127.1	139.9	150.7	188.6
NiS ₂	65.7			72.8	70.0	81.0	85.2
NiSO ₄				142.6	150.8	159.2	167.4

TABLE 6.4 Heats of Fusion, Vaporization, and Sublimation and Specific Heat at Various Temperatures of the Elements and Inorganic Compounds (*Continued*)

Substance	ΔH_m	ΔH_v	ΔH_s	C_p			
				400 K	600 K	800 K	1000 K
NiWO ₄				138.9	144.6	150.3	155.9
Niobium							
Nb	30	689.9	726	25.4	26.3	27.2	28.0
NbBr ₅	24.0	50.2	112.5	147.9(c)	147.9(lq)		
NbCl ₅	38.3	52.7		170.7(c)	127.9(g)	129.8	130.7
NbF ₅	12.2	52.3		43.5(lq)			
NbI ₅	37.7	58.6		182.0(c)			
NbN, $\Delta H_t = 4.2^{1370}$	46.0			45.4	49.9	51.6	53.2
NbO	85	618		44.0	47.2	49.5	51.5
NbO ₂ , $\Delta H_t = 3.42^{817}$	92		598.0	63.5	71.7	70.5	87.5
Nb ₂ O ₅	104.3			145.0	160.7	170.0	175.5
Nitrogen							
N ₂ , $\Delta H_t = 0.230^{-237.53}$	0.720	5.577		29.2	30.1	31.4	32.7
NF ₃		11.6		61.9	71.4	76.0	78.4
N ₂ F ₂ <i>cis</i>	15.4	91.6		58.2	68.3	73.6	76.6
<i>trans</i>	14.2	87.9		60.2	68.9	73.8	76.7
N ₂ F ₄		13.3					
NH ₃ (<i>see</i> Ammonium)							
N ₂ H ₄	12.66	41.8	44.7	61.7(g)	77.6	88.2	96.4
NO	2.30	13.83		29.9	31.2	32.8	34.0
NOCl		25.8		47.1	50.7	53.2	54.9
NOF		19.3		44.6	48.9	51.7	53.5
NOF ₃				78.7	90.9	97.0	100.5
NO ₂				40.5	46.4	50.4	53.0
NO ₂ Cl		25.7		59.6	68.1	73.1	76.1
NO ₂ F		18.0		57.0	66.4	71.9	75.3
NO ₃				55.9	67.4	73.3	76.5
N ₂ O	6.54	16.53		42.7	48.4	52.2	54.9
N ₂ O ₄	14.65	38.12		88.5	104.0	113.4	119.2
N ₂ O ₅			62.3	110.9	128.4	137.0	141.4
NSF		22.2					
Osmium							
Os	57.85	738		25.1	25.9	26.7	27.4
OsF ₆		28.62					
OsO ₄	9.8	39.54					
Oxygen							
O ₂ , $\Delta H_t = 0.092^{-249.49}$ $\Delta H_t = 0.745^{-229.38}$	0.444	6.820	8.204	30.11	32.09	33.74	34.88
O ₃		10.84		43.74	49.86	53.15	55.02
OF ₂		11.09		64.3	72.4	76.4	78.6
O ₂ F ₂		19.1					
Palladium							
Pd	16.74	362		26.5	27.7	28.8	30.0
PdCl ₂	40.1						
PdO				37.6	49.5	61.3	
Phosphorus							
P		0.66	12.4	14.2			
P ₄ , $\Delta H_t = 0.521^{-77.8}$	0.659	56.5	58.9	73.3(g)	78.4	80.4	81.4
PBr ₃		38.8		78.9	81.2	82.0	82.4
PClF ₂		17.6					

TABLE 6.4 Heats of Fusion, Vaporization, and Sublimation and Specific Heat at Various Temperatures of the Elements and Inorganic Compounds (*Continued*)

Substance	ΔH_m	ΔH_v	ΔH_s	C_p			
				400 K	600 K	800 K	1000 K
PClF ₃		17.6					
PCl ₂ F		24.9					
PCl ₃	7.10	30.5	32.1	76.0(g)	79.7	81.2	81.9
PCl ₅			64.9	120.1(g)	126.8	129.5	130.7
PF ₃		16.5		66.3(g)	74.0	77.6	79.5
PF ₅		17.2		99.2(g)	114.7	121.9	125.6
PH ₃	1.130	14.60		41.8	50.9	58.5	64.3
P ₂ H ₄		28.8					
PI ₃		43.9					
P ₄ O ₆	14.06	43.43		172.1	200.8	213.5	220.0
P ₄ O ₁₀	27.2		106.0	260.3	336.0(c)		
POBr ₃	38						
POCl ₃	13.1	34.3	38.6	92.0(g)	99.1	102.5	108.5
POClF ₂		25.4		79.3	91.6	97.7	101.1
POCl ₂ F		30.96		87.7	96.6	100.9	103.2
POF ₃	15.06	23.22	21.1	79.1	91.2	97.4	100.9
PSCl ₃				96.5	102.4	104.8	105.9
PSF ₃		19.58		84.5	95.3	100.3	102.9
P ₄ S ₃	9.2	59.8		184.1	184.1(lq)	155.0(g)	155.0
Platinum							
Pt	22.17	469	545	26.4	27.5	28.5	29.6
PtS				51.4	53.8	56.2	58.6
PtS ₂				69.9	75.9	81.9	87.9
Plutonium							
Pu, $\Delta H_t = 13.4^{122}$ $\Delta H_t = 2.9^{206}$ $\Delta H_t = 3.3^{319}$ $\Delta H_t = 66.9^{480}$	2.82	333.5		39.5	46.9	40.6	40.6
PuBr ₃	55.2	236.4	292.5				
PuCl ₃	63.6	241.0	304.6				
PuF ₃	59.8		374.9				
PuF ₄	65.3		299.6				
PuF ₆	17.6	29.9	48.5				
PuI ₃	50.2						
PuO ₂		559.8					
Polonium							
Po		102.91					
Potassium							
K	2.321	76.90	88.8	31.5(lq)	30.1	29.8	30.7
KAlCl ₄				165.5	183.2	196.6	202.1
K ₃ AlCl ₆				259.2	279.5	295.8	
K ₃ AlF ₆				244.5	269.4	286.8	302.0
KBF ₄ , $\Delta H_t = 14.06^{283}$	17.7			130.8	142.1	150.9	167.2
KBH ₄				100.9	106.0	118.4	
KBO ₂	31	238.9		76.7	89.8	98.5	
K ₂ B ₄ O ₇	104			206.3	250.5	271.1	283.3
KBr	25.5	149.2		53.8	56.4	60.4	68.0
KCl	26.53	124.3		53.0	55.9	59.2	64.0
KClO ₄ , $\Delta H_t = 13.77^{299.6}$				138.5	165.3		
KCN, $\Delta H_t = 1.167^{-104.9}$	14.6	157.1		66.3	66.4	66.5(c)	66.5(lq)

TABLE 6.4 Heats of Fusion, Vaporization, and Sublimation and Specific Heat at Various Temperatures of the Elements and Inorganic Compounds (*Continued*)

Substance	ΔH_m	ΔH_v	ΔH_s	C_p			
				400 K	600 K	800 K	1000 K
K ₂ CO ₃	27.6			128.1	150.7	170.0	189.0
K ₂ CrO ₄	29.0						
K ₂ Cr ₂ O ₇	36.7						
KF	27.2	141.8	231.8	51.0	54.3	57.4	61.2
KH				44.1	51.9		
KHF ₂ , $\Delta H_t = 11.22^{196.7}$	6.62			86.1(c)	104.6(lq)		
KI	24.0	190.9	202.4	53.9	57.3	62.6(c)	72.4(lq)
KNO ₃ , $\Delta H_t = 5.10^{128}$	10.1			108.4	120.5		
K ₂ O, $\Delta H_t = 6.20^{372}$				79.1	100.0	100.0	100.0
KO ₂ , $\Delta H_t = 0.302^{-79.7}$ $\Delta H_t = 0.157^{-42.3}$				83.9	90.2		
K ₂ O ₂				107	121		
KOH, $\Delta H_t = 6.4^{243}$	8.60	142.7	192	72.5	79.0(c)	83.0(lq)	83.0
KPO ₃	8.8						
K ₃ PO ₄	37.2						
K ₂ P ₂ O ₇	58.6						
KReO ₄	85.4						
K ₂ S	16.15	77.3	82.5	87.7			
K ₂ SiO ₃	50			135.6	157.7	170.7	179.1
K ₂ SO ₄ , $\Delta H_t = 8.45^{584}$	34.39			147.6	172.5	199.6	226.1
K ₂ WO ₄	19.5						
K ₂ ZrCl ₆	23.0						
Praseodymium							
Pr	6.89	331	356				
Promethium							
Pm	7.13	289	328				
Protactinium							
Pa	12.34	481					
PaCl ₃	92.9	61.3					
Radium							
Ra	8.5	113					
Radon							
Rn	3.247	18.10					
Rhenium							
Re	60.43	704	779	26.0	26.9	28.0	29.1
ReF ₅		58.1					
ReF ₆	4.6	28.7					
ReF ₇	7.5	38.3					
ReO ₂			274.6				
ReO ₃	21.8		208.4				
Re ₂ O ₇	64.2	74.1					
ReOCl ₄		45.6					
ReOF ₄	13.5	61.0					
ReOF ₅		32.0	37.4				
Rhodium							
Rh	26.59	494	556	26.0	28.0	30.0	32.0
Rh ₂ O ₃				109.9	121.4	133.0	144.5
Rubidium							
Rb	2.19	75.77		31.7	30.9	30.7	
RbBr	15.5	154.8		52.8	54.9	57.1(c)	66.9(lq)

TABLE 6.4 Heats of Fusion, Vaporization, and Sublimation and Specific Heat at Various Temperatures of the Elements and Inorganic Compounds (*Continued*)

Substance	ΔH_m	ΔH_v	ΔH_s	C_p			
				400 K	600 K	800 K	1000 K
RbCl	18.4	165.7		52.3	54.3	56.4(c)	64.0(lq)
RbClO ₄ , $\Delta H_f = 12.59^{284}$							
RbF	17.3	177.8		51.9	57.9	64.9	72.3
RbI	12.5	150.6			55.1	57.3(c)	66.9(lq)
RbNO ₃	5.61						
RbOH	6.78						
Ruthenium							
Run, $\Delta H_f = 0.13^{1035}$	38.59	591.6		24.5	25.7	27.0	28.2
$\Delta H_f = 0.96^{1500}$							
Samarium							
Sm, $\Delta H_f = 3.11^{917}$	8.62	165	207	33.3	39.1	44.3	49.3
Sm ₂ O ₃ , $\Delta H_f = 1.05^{922}$				125.2	135.3	141.4	146.3
Scandium							
Sc	14.1	332.7	376				
ScCl ₃				96.7	102.7	108.7	114.6
Sc ₂ O ₃				106.4	111.1	115.8	120.5
Selenium							
Se, $\Delta H_f = 0.75^{150}$	6.69	95.48		28.1(c)	35.2(lq)	35.1	
SeF ₄		47.2					
SeF ₆	8.4		26.8	127.9	141.3	147.1	150.7
SeO ₂		94.5					
SeOCl ₂	4.23	42.7					
Silicon							
Si	50.21	359	450	22.3	24.5	25.7	26.5
SiBr ₄		37.9		146.4(lq)	104.9(g)	106.2	106.2
SiC beta				34.1	41.8	45.9	48.4
SiCl ₄	7.60	28.7	29.7	96.9(g)	102.6	104.8	106.0
SiClF ₃		18.7		88.3	97.5	101.7	103.8
SiCl ₂ F ₂		21.2					
SiF ₄			25.7	83.1	94.1	99.4	102.3
SiH ₄	0.67	12.1		51.5	65.9	76.7	84.5
Si ₂ H ₆		21.2					
Si ₃ H ₈		28.5					
SiH ₃ Br		24.4					
SiH ₂ Br ₂		31					
SiHBr ₃		34.8					
SiH ₃ Cl		21		60.7	74.0	83.1	89.4
SiH ₂ Cl ₂		25.2	24.2	71.5	82.9	90.0	94.6
SiHCl ₃		26.6	25.7	83.7	92.5	97.2	100.2
SiH ₃ F		18.8		57.2	71.8	81.7	88.3
SiH ₂ F ₂		16.3					
SiHF ₃		16.2					
SiL ₄	19.7	56.9	79	164.0(lq)	106.0(g)	106.9	107.3
Si ₃ N ₄				110.7	129.7	145.8	158.2
SiO ₂ cristobalite	8.51						
SiO ₂ quartz	7.7		600	53.5	64.4	76.2	68.94
$\Delta H_f = 0.73^{574}$							
$\Delta H_f = 2.0^{806}$							
SiOF ₂				61.3	70.4	75.0	77.6
SiS ₂	20.9			78.6	81.7	83.4	85.4

TABLE 6.4 Heats of Fusion, Vaporization, and Sublimation and Specific Heat at Various Temperatures of the Elements and Inorganic Compounds (*Continued*)

Substance	ΔH_m	ΔH_v	ΔH_s	C_p			
				400 K	600 K	800 K	1000 K
Silver							
Ag	11.95	258		25.7	26.8	28.4	30.0
AgBr	9.12	198		59.0	71.8(c)	62.3(lq)	62.3
AgCl	13.2	199		56.9	54.4	54.4	54.4
Ag ₂ CO ₃					122.6		
AgF	16.7	179.1		54.1(c)	58.4		
AgI, $\Delta H_t = 6.15^{147}$	9.41	143.9		64.7	56.5	56.5	58.6(lq)
AgNO ₃ , $\Delta H_t = 2.5^{160}$	11.5			112.5	128.0		
Ag ₂ O				73.0			
Ag ₂ S, $\Delta H_t = 5.86^{176}$	14.1			86.6	90.5	90.5	90.5
$\Delta H_t = 5.86^{586}$							
Sodium							
Na	2.60	97.42	107.5	31.5(lq)	29.3	29.9	29.0
NaAlCl ₄				164.8(c)			
Na ₃ AlCl ₆				254.4	273.0		
Na ₃ AlF ₆ , $\Delta H_t = 8.37^{565}$	107.28			234.6	261.8	196.8	282.8
$\Delta H_t = 0.42^{880}$							
NaAlO ₂ , $\Delta H_t = 1.297^{467}$				83.4	94.3	98.7	102.3
NaBH ₄ , $\Delta H_t = 0.999^{-83.3}$				94.6	108.6		
NaBO ₂	36.2	239.7	322.2	75.4	88.6	97.2	103.2
Na ₂ B ₄ O ₇	76.9			221.7	268.6	444.9(lq)	
NaBr	26.11	160.7	217.5	53.5	56.1	58.6	61.1
NaBrO ₃	28.11						
NaCl	28.16			52.3	55.5	59.3	72.5
NaClO ₃	22.1						
NaClO ₄ , $\Delta H_t = 13.98^{308}$				136.0(c)			
NaCN	8.79	148.1	172.8	68.7	68.8	69.0	
Na ₂ CO ₃ , $\Delta H_t = 0.690^{450}$	29.64			125.1	163.3	153.3	179.8
NaF	33.35	176.1	284.9	49.6	52.7	55.7	59.5
NaH				42.5	50.7		
NaI	23.60			53.8	56.2	58.5(c)	64.9(lq)
NaIO ₃ , $\Delta H_t = 35.1^{422}$							
NaNO ₃	15						
NaO ₂ , $\Delta H_t = 1.464^{-76.7}$				76.3	84.5	92.6	
$\Delta H_t = 1.548^{-49.9}$							
Na ₂ O, $\Delta H_t = 1.76^{750.1}$	47.7			75.8	85.7	91.3	94.9
$\Delta H_t = 11.92^{970.1}$							
Na ₂ O ₂ , $\Delta H_t = 5.73^{512}$				97.7	108.4	113.6	
NaOH, $\Delta H_t = 72^{299.6}$	6.60	175.3	228.2	64.9(c)	86.1(lq)	84.9	83.7
Na ₂ S	19.3			20.1	20.9	21.5	22.0
Na ₂ S ₂				104.3	115.4(c)	124.7(lq)	124.7
Na ₂ SiO ₃	51.8			127.8	147.1	159.7	169.4
Na ₂ Si ₂ O ₅ , $\Delta H_t = 0.42^{678}$	35.6			183.4	217.6	235.2	292.9
Na ₂ SO ₄ , $\Delta H_t = 10.91^{241}$	23.6			145.1	175.3	187.3	200.3
Na ₂ TiO ₃	70.3						
Na ₂ WO ₄ , $\Delta H_t = 30.85^{587.7}$	23.80			155.3	178.2	198.7	
$\Delta H_t = 4.113^{588.9}$							
Strontium							
Sr, $\Delta H_t = 0.84^{547}$	7.43	136.9	164.0	27.8	29.8	31.9	34.1
SrBr ₂ , $\Delta H_t = 12.2^{645}$	10.1	194.1	310	79.0	82.7	87.6(c)	116.4(lq)

TABLE 6.4 Heats of Fusion, Vaporization, and Sublimation and Specific Heat at Various Temperatures of the Elements and Inorganic Compounds (*Continued*)

Substance	ΔH_m	ΔH_v	ΔH_s	C_p			
				400 K	600 K	800 K	1000 K
SrCl ₂ , $\Delta H_f = 6.0^{727}$	17.5	248.1	356	78.9	83.7	90.8	105.8
SrCO ₃ , $\Delta H_f = 19.7^{924}$	40			95.1	107.1	116.1	124.0
SrF ₂ , $\Delta H_f = 0.04^{1148}$ $\Delta H_f = 0.04^{1211}$	28.5	320	451.0	74.7	79.8	81.0	85.8
SrI ₂	19.67	189.7	286.6	80.7	86.3	91.8(c)	110.0(lq)
SrH ₂	23						
SrMoO ₄				131.5	145.4	154.0	161.2
SrO	81			48.5	52.0	54.3	56.1
SrO ₂				81.3	85.0		
Sr(OH) ₂	23			88.5	115.0(c)	157.8(lq)	157.8
SrS	63			50.2	53.2	54.9	56.2
SrSO ₄	36			113.5	124.6	135.7	146.9
Sulfur							
S monoclinic $\Delta H_f = 0.400^{95.2}$	1.727	45	62.2	23.2	23.3(lq)	21.8(g)	21.5
S ₈				167.1	177.9	186.7	193.6
SCl ₂		32.4		53.6	56.0	56.9	57.4
S ₂ Cl ₂		36.0		124.3(lq)	80.8(g)	82.6	83.5
SF ₄		26.4		87.5	97.3	101.7	103.8
SF ₆	5.02	17.1	9.0	116.4	136.1	144.8	149.3
S ₂ F ₁₀				211.4	246.4	261.8	269.2
SO ₂	7.40	24.94	22.92	43.43	48.9	52.3	54.3
SO ₃	8.60	40.7	43.14	57.7	67.3	72.8	76.0
SOCl ₂		31.7	31	71.3	76.4	78.9	80.3
SOF ₂		21.8		64.3	72.4	76.4	78.6
SO ₂ Cl ₂		31.38	30.1	85.2	94.5	99.4	102.1
SO ₂ ClF				81.1	92.1	97.9	101.1
SO ₂ F ₂		20.0		76.5	89.3	96.1	99.9
Tantalum							
Ta	36.57	732.8	778	25.8	26.8	27.5	27.9
TaB ₂	83.7			57.6	66.6	72.2	83.3
TaBr ₅	45.6	62.3		168.2			
TaC	105			41.7	46.5	49.1	51.1
Ta ₂ C				66.7	72.4	76.2	79.5
TaCl ₅	41.6	54.8	94.1	148.(c)	129.(g)	131	132
TaF ₅	18.8	56.9		182.0(lq)			
TaI ₅	41.8	64.9		164.6	182.0(c)	120.0(g)	120.6
TaN	67			45.4	51.9	58.5	65.0
TaO ₂				47.7	52.3	54.6	55.7
Ta ₂ O ₅	120			147.5	164.4	175.2	182.8
Technetium							
Tc	33.29	585.2		25.1	26.8	28.5	30.1
TcF ₆	4.72	31.1					
TcO ₃ F	22.5	39.5					
Tellurium							
Te	17.49	114.1		28.0	32.3(c)	37.7(lq)	37.7
TeCl ₄	18.8	77		138.9(c)	222.6(lq)	108.8(g)	108.8
TeF ₄		34.3					
TeF ₆			28.2	132.2	143.8	148.7	151.7
Te ₂ F ₁₀		39.5					

TABLE 6.4 Heats of Fusion, Vaporization, and Sublimation and Specific Heat at Various Temperatures of the Elements and Inorganic Compounds (*Continued*)

Substance	ΔH_m	ΔH_v	ΔH_s	C_p			
				400 K	600 K	800 K	1000 K
TeH ₂		23.9					
TeO ₂	29.1			67.9	72.5	76.1	79.2
Terbium							
Tb	10.15	293	389				
Thallium							
Tl, $\Delta H_t = 0.38^{234}$	4.14	165	181	27.5(c)	30.1(lq)	30.1	30.1
TlBr	16.4	99.6		53.5	59.5(c)	75.5(lq)	67.8
TlCl	15.56	102.2		53.6	55.2(c)	59.4(lq)	59.4
Tl ₂ CO ₃	18.4						
TlF	13.87	115.9			66.8(lq)	67.3	
TlI	14.73	104.7		53.9	60.6(c)	72.0(lq)	72.0
TlNO ₃	9.56						
Tl ₂ O	30.3						
Tl ₂ O ₃	53						
Tl ₂ S	12	154					
Tl ₂ SO ₄	23.0						
Thorium							
Th, $\Delta H_t = 2.73^{1360}$	13.81	514		28.4	30.5	32.7	34.4
ThBr ₄	66.9						
ThCl ₄ , $\Delta H_t = 5.0^{406}$	40.2	146.4		126.7	132.7	136.4	139.6
ThF ₄	44.0	258					
ThI ₄	61.4	56.9					
Th ₃ N ₄				169.5	196.5	222.7	
ThO ₂	1218.0			67.4	72.4	75.3	77.7
ThOCl ₂				97.0	102.5	105.9	108.6
Th(SO ₄) ₂				197.0	243.2	289.4	
Thullium							
Tm	16.84	247	232.2				
Tin							
Sn white, $\Delta H_t = 2.09^{13}$	7.03	296.1		28.9	28.9(c)	28.7(lq)	28.7
SnBr ₂	7.2	102					
SnBr ₄	11.9	43.5		158.0(lq)	106.8(g)	107.3	107.5
SnCl ₂	12.8	86.8		83.3(c)	92.1(lq)	92.1	92.1
SnCl ₄	9.20	34.9					
SnH ₄		19.1					
SnI ₂		105					
SnO				45.8	48.7	51.7	54.6
SnO ₂ , $\Delta H_t = 1.88^{410}$				64.4	73.9	78.5	81.8
$\Delta H_t = 1.26^{540}$							
SnS, $\Delta H_t = 0.67^{602}$				50.5	55.5	61.3	
SnS ₂				71.9	75.4	79.0	82.5
Titanium							
Ti, $\Delta H_t = 4.2^{893}$	14.15	425	469	26.9	28.6	29.5	32.1
TiB				40.3	48.6	50.9	51.9
TiB ₂	100.4			54.9	66.2	72.1	76.9
TiBr ₂			206.2	79.9	82.1	84.4	86.7
TiBr ₃			138.8	105.8	125.5	147.3	156.7
TiBr ₄	12.9	44.4		151.9(lq)	106.1(g)	106.9	107.3
TiC	71			40.7	47.7	49.9	51.2
TiCl ₂		232	212	73.4	78.4	82.2	85.9

TABLE 6.4 Heats of Fusion, Vaporization, and Sublimation and Specific Heat at Various Temperatures of the Elements and Inorganic Compounds (*Continued*)

Substance	ΔH_m	ΔH_v	ΔH_s	C_p			
				400 K	600 K	800 K	1000 K
TiCl ₃		124	166.3	98.6	102.0	104.4	106.7
TiCl ₄	9.97	36.2		146.2(lq)	104.4(g)	106.0	106.7
TiF ₃			222	93	98	103	109
TiF ₄			97.9	126.7(c)	100.2(g)	103.3	104.9
TiH ₂				39.3	53.8	63.1	68.5
TiI ₂			217	87.0	88.4	89.9	91.3
TiI ₃				117.5	119.0	120.4(c)	20.6(g)
TiI ₄ , $\Delta H_t = 9.9^{106}$	19.8	58.4		148.1(c)	156.6(lq)	25.7(g)	27.8
TiN	66.9			43.8	48.7	50.6	52.1
TiO, $\Delta H_t = 4.2^{992}$	41.8			45.0	50.8	55.2	59.1
TiO ₂ rutile	58.0		673	63.6	70.9	73.9	75.3
Ti ₂ O ₃ , $\Delta H_t = 1.138^{197}$	105			117.5	136.4	143.0	146.4
Tungsten							
W	52.31	806.7	851	24.9	25.9	26.7	27.6
WBr ₅	17.1	81.5		166.(c)	182.(lq)	132.2(g)	132.5
WBr ₆				192.5(c)	156.3(g)	157.0	157.4
WCl ₄				135.3	146.2(c)	106.7(g)	107.2
WCl ₅	20.5	68.1	100	167.4(c)	129.5(g)	131.0	131.8
WCl ₆ , $\Delta H_t = 4.1^{177}$	6.60	52.7	79.2	192.5(c)	200.8(lq)	155.8(g)	156.6
W(CO) ₆			72.0				
WF ₆ , $\Delta H_t = 2.067^{-8.5}$	4.10	27.05	26.65	132.4(g)	145.0	150.3	153.0
WO ₂			666.3	63.4	71.3	75.5	78.2
WO ₃ , $\Delta H_t = 1.49^{777}$	73.4	76.6	550.2	82.2	93.1	98.2	101.7
WOCl ₄	45	67.8		157.(c)	123.2(g)	127.0	129.1
WOF ₄	5.0	56		107.8	119.8	125.0	127.8
WO ₂ Cl ₂				115.1	135.6(c)		
Uranium							
U, $\Delta H_t = 2.93^{672}$ $\Delta H_t = 4.791^{772}$	9.14	417.1	525	29.0	34.8	41.6	41.8
UBr ₃	43.9						
UBr ₄	55.2	119.2		131.4	140.1(c)	163.2(lq)	163.2
UC				64.6	58.3	60.3	62.2
UCl ₃	46.4	193.0		102.8	107.7	113.6	119.9
UCl ₄	44.8	141.4		126.1	134.4	142.0	162.5
UCl ₅	35.6	75.3		150.9	159.8(c)	186.7(lq)	134.5(g)
UCl ₆	20.9	50.2		182.8	214.0	158.8	168.0
UF ₃				99.0	104.9	111.0	117.2
UF ₄	42.7	221.8		119.1	125.0	130.9	136.8
UF ₅	33.5			136.4	143.1(c)	166.6(lq)	
UF ₆	19.19	28.90	48.20	140.5(g)	148.7	152.2	154.4
UH ₃				50.9	57.4	66.1	
UI ₄	70.7	130.6		140.6	149.5(c)	165.7(lq)	165.7
UN				52.2	56.3	58.3	59.8
UO ₂				72.7	79.8	83.2	85.5
UO ₃				88.9	95.3	99.0	
U ₃ O ₈				266.0	290.7	304.2	
UOCl ₂				101.9	109.6	115.1	
UO ₂ Cl ₂				118.1	126.2	130.0	
UO ₂ F ₂				113.9	122.5	126.7	129.5

TABLE 6.4 Heats of Fusion, Vaporization, and Sublimation and Specific Heat at Various Temperatures of the Elements and Inorganic Compounds (*Continued*)

Substance	ΔH_m	ΔH_v	ΔH_s	C_p			
				400 K	600 K	800 K	1000 K
Vanadium							
V	21.5	459	516	26.2	27.5	28.7	30.1
VCl ₄	2.30	41.4	42.5	161.7(lq)	100.1(g)	102.6	104.7
VF ₅	50.0	44.5					
VN, $\Delta H_{dec} = 227.6^{2346}$			741	43.3	48.2	51.2	53.7
VO	63			49.6	53.5	57.1	60.5
VO ₂ , $\Delta H_t = 4.21^{72}$	56.9			67.2	74.3	77.8	80.2
V ₂ O ₃ , $\Delta H_t = 1.623-104.3$	117.2			117.5	127.3	132.6	138.0
V ₂ O ₄ , $\Delta H_t = 9.0^{67}$	112.1			135.3	148.4	155.5	160.7
V ₂ O ₅	64.5	263.6		151.0	168.3	177.3	183.7
VOCl ₃		36.8					
Xenon							
Xe	1.81	12.64		20.79(g)	20.79	20.79	20.79
Ytterbium							
Yb	7.66	159					
Yttrium							
Y, $\Delta H_t = 4.97^{1485}$	11.42	365	425	27.3	28.5	29.9	31.5
Y ₂ O ₃ , $\Delta H_t = 1.30^{1057}$	105			113.3	121.3	124.7	126.9
Zinc							
Zn	7.32	123.6		26.3	28.6(c)	31.4(lq)	31.4
ZnBr ₂	16.7	118		70.1(c)	78.8(lq)	113.8	61.5(g)
ZnCl ₂	10.25	126		69.9(c)	100.8(lq)	100.8	100.8
ZnF ₂		190.1		66.9	69.1	71.4	73.7
ZnO, $\Delta H_t = 13.4^{1020}$	52.3			49.4	52.4	54.1	55.5
Zn ₂ SiO ₄				129.4	141.4	153.4	165.4
ZnSO ₄ , $\Delta H_t = 20.3^{740}$				116.0	137.4	139.7	142.0
Zirconium							
Zr, $\Delta H_t = 4.02^{862}$	21.00	573	610.0	25.9	27.3	29.0	31.1
ZrB ₂	104.6			57.5	65.8	69.7	72.1
ZrBr ₂	63	131.5	230	87.9	90.2	92.5	94.8
ZrBr ₄				129.3	133.3(c)	107.2(g)	107.6
ZrC	79.5			43.6	49.4	52.3	53.4
ZrCl ₂	27	45.0		76.0	80.0	83.1	85.9
ZrCl ₃			190	101	106	109	112
ZrCl ₄	50		110.5	125.4	131.1(c)	106.5(g)	107.1
ZrF ₂	33	289	404	70	76	81	84
ZrF ₄	64.2		237.7	113.5	124.0	129.4	134.1
ZrI ₂	25.1	113		95.0	96.6	106.1	123.6
ZrI ₃			176	105.9	106.7	107.1(c)	82.9(g)
ZrI ₄			126.4	131.0	134.6(c)	107.6(g)	107.6
ZrN	67.4			44.8	48.7	50.9	52.7
ZrO ₂ , $\Delta H_t = 5.02^{1205}$	87.0	624		63.9	70.2	73.5	75.7
ZrSiO ₄				114.6	133.7	142.7	147.3

6.2 CRITICAL PHENOMENA

The *critical temperature*, T_c , of a gas is the temperature above which the gas cannot be liquefied no matter how high the pressure.

The *critical pressure*, P_c , is the lowest pressure which will liquefy the gas at its critical temperature.

The *critical volume*, V_c , is the volume of 1 mol at the critical temperature and the critical pressure. It can be computed from the critical density, ρ_c , as follows:

$$\frac{\text{Molecular weight (in g} \cdot \text{mol}^{-1})}{\rho_c \text{ (in g} \cdot \text{cm}^{-3})} = V_c \text{ (in cm}^3 \cdot \text{mol}^{-1})$$

The critical pressure, critical molar volume, and critical temperature are the values of the pressure, molar volume, and thermodynamic temperature at which the densities of coexisting liquid and gaseous phases just become identical. At this critical point, the *critical compressibility factor*, Z_c , is:

$$Z_c = \frac{P_c V_c}{RT_c}$$

TABLE 6.5 Critical Properties

Substance	T_c , °C	P_c , atm	P_c , MPa	V_c , cm ³ · mol ⁻¹	ρ_c , g · cm ⁻³
Acetaldehyde	193	55	5.57	154	0.286
Acetic acid	319.56	57.1	5.786	171.3	0.351
Acetic anhydride	333	39.5	4.0	290	0.352
Acetone	235.0	46.4	4.700	209	0.278
Acetonitrile	272.4	47.7	4.85	173	0.237
Acetophenone	436.4	38	3.85	386	0.311
Acetyl chloride	235	58	5.88	204	0.325
Acetylene	35.2	60.6	6.14	113	0.231
Acrylic acid	342	56	5.67	210	0.343
Acrylonitrile	263	45	4.56	210	0.253
Air	-140.6	37.2	3.77	92.7	0.313
Allene	120	54.0	5.47	162	0.247
Allyl alcohol	272.0	56.4	5.71	203	0.286
Aluminum tribromide	490	28.5	2.89	310	0.860
Aluminum trichloride	356	26	2.63	261	0.510
2-Aminoethanol	341	44	4.46	196	0.312
Ammonia	132.4	111.3	11.28	72.5	0.235
Aniline	426	49.5	4.89	287	0.324
Anthracene	610	28.6	2.90	554	0.322
Antimony tribromide	631.4	56	5.67		
Antimony trichloride	521			270	0.84
Argon	-122.3	48.1	4.87	74.6	0.536
Arsenic	1400				
Arsenic trichloride	318	58.4	5.91	252	0.720
Arsine	99.9	63.3	6.41	133	0.588
Arsine- d_3	98.9				
Benzaldehyde	422	45.9	4.65	324	0.327
Benzene	288.90	48.31	4.895	255	0.306
Benzoic acid	479	41.55	4.21	341	0.358
Benzonitrile	426.3	41.55	4.21	339	0.304
Benzyl alcohol	422	42.4	4.3	334	0.324
Biphenyl	516	38.0	3.85	502	0.307
Bismuth tribromide	946			301	1.49
Bismuth trichloride	906	118	11.96	261	1.21
Boron pentafluoride	205				
Boron tribromide	308	48.1	4.87	272	0.921
Boron trichloride	178.8	38.2	3.87	266	0.441

TABLE 6.5 Critical Properties (*Continued*)

Substance	T_c , °C	P_c , atm	P_c , MPa	V_c , cm ³ · mol ⁻¹	ρ_c , g · cm ⁻³
Boron trifluoride	-12.3	49.2	4.98	124	0.549
Bromine	315	102	10.3	135	1.184
Bromobenzene	397	44.6	4.52	324	0.485
Bromochlorodifluoromethane	158.8	41.98	4.254	246	0.672
Bromoethane	230.8	61.5	6.23	215	0.507
Bromomethane	173.4	85	8.61	156	0.609
Bromopentafluorobenzene	397	44.6	4.52		
1-Bromopropane	-1.8				0.462
2-Bromopropane	-14.2				0.462
Bromotrifluoromethane	67.1	39.2	3.97	200	0.76
1,2-Butadiene	170.6	44.4	4.50	219	0.247
1,3-Butadiene	152	42.7	4.33	221	0.245
Butanal	264.1	42.6	4.32	258	0.279
Butane	151.97	37.34	3.784	255	0.228
Butanenitrile	312.3	38.3	3.88	285	0.242
Butanoic acid	351	39.8	4.03	290	0.304
1-Butanol	289.9	43.56	4.414	275	0.270
2-Butanol	263.1	41.47	4.202	269	0.276
2-Butanone	263.63	41.52	4.207	267	0.270
1-Butene	146.5	39.7	4.02	240	0.234
<i>cis</i> -2-Butene	147.5	40.5	4.10	238	0.240
<i>trans</i> -2-Butene	147.5	40.5	4.10	238	0.236
3-Butenenitrile	312.3	38.3	3.88	265	0.253
1-Buten-3-yne	182	49	4.96	202	0.258
Butyl acetate	306.7	31	3.14	400	0.290
1-Butylamine	258.8	41.9	4.25	277	0.264
<i>sec</i> -Butylamine	241.2	41.4	4.20	278	0.263
<i>tert</i> -Butylamine	210.8	37.9	3.84	292	0.250
Butylbenzene	387.4	28.5	2.89	497	0.270
<i>sec</i> -Butylbenzene	391	29.1	2.94	510	0.263
<i>tert</i> -Butylbenzene	387	29.3	2.97	490	0.273
Butyl benzoate	450	26	2.63	561	0.318
Butyl butanoate	338				0.292
Butylcyclohexane	394	31.1	3.15	534	0.63
<i>sec</i> -Butylcyclohexane	396	26.4	2.67		
<i>tert</i> -Butylcyclohexane	385.9	26.3	2.66		
Butylcyclopentane	357.9				
Butyl ethyl ether	257.9	30	3.04	390	0.262
2-Butylhexadecafluoro- tetrahydrofuran	227.1	15.86	1.607	588	0.707
Butylisopropylamine	290.5				
<i>tert</i> -Butyl methyl sulfide	296.7				
1-Butyne	190.6	46.5	4.71	220	0.246
2-Butyne	215.5	50.2	5.09	221	0.246
4-Butyrolactone	436				
Carbon dioxide	31.1	72.8	7.38	94.0	0.468
Carbon disulfide	279	78.0	7.90	173	0.41
Carbon monoxide	-140.2	34.5	3.50	93.1	0.301
Carbon tetrachloride	283.3	45.0	4.56	276	0.558
Carbon tetrafluoride	-45.7	36.9	3.74	140	0.629
Carbonyl chloride	182	56	5.67	190	0.52
Carbonyl sulfide	102	58	5.88	140	0.44
Cesium	1806			300	0.44

TABLE 6.5 Critical Properties (*Continued*)

Substance	T_c , °C	P_c , atm	P_c , MPa	V_c , cm ³ · mol ⁻¹	ρ_c , g · cm ⁻³
Chlorine	143.8	76.1	7.71	124	0.573
Chlorine pentafluoride	142.6	51.9	5.26	230.9	0.565
Chlorine trifluoride	153.5				
Chlorobenzene	359.3	44.6	4.52	308	0.365
1-Chlorobutane	268.9	36.4	3.69	312	0.297
2-Chlorobutane	247.5	39	3.95	305	0.303
1-Chloro-1,1-difluoroethane	137.1	40.7	4.12	231	0.435
2-Chloro-1,1-difluoroethylene	127.5	44.0	4.46	197	0.499
Chlorodifluoromethane	96.1	49.1	4.98	165	0.525
1-Chloro-2,3-epoxypropane	351				
Chloroethane	187.3	52.0	5.27	199	0.324
Chloroform	263.3	54.0	5.47	239	0.504
1-Chlorohexane	321.5				
Chloromethane	143.1	65.9	6.679	139	0.353
2-Chloro-2-methylpropane	234	39	3.95	295	0.314
Chloropentafluoroacetone	137.6	28.4	2.88		
Chloropentafluorobenzene	297.9	31.8	3.22		
Chloropentafluoroethane	80.1	31.9	3.229	252	0.613
1-Chloropentane	295.4				
1-Chloropropane	230	45.2	4.58	254	0.309
2-Chloropropane	212	46.6	4.72	230	0.341
3-Chloropropene	241	47	4.76	234	0.336
Chlorotrifluoromethane	29	38.98	3.946	180	0.579
Chlorotrifluorosilane	35.4	34.2	3.47		
Chlorotrimethylsilane	224.7	31.6	3.20		
1,2-Cresol	424.5	49.4	5.01	282	0.384
1,3-Cresol	432.7	45.0	4.56	309	0.346
1,4-Cresol	431.5	50.8	5.15	277	0.391
Cyanogen	126.7	62.2	6.30	145	0.360
Cyclobutane	186.8	49.2	4.99	210	0.267
Cycloheptane	316	36.7	3.72	390	0.252
Cyclohexane	280.4	40.2	4.07	308	0.273
<i>trans</i> -Cyclohexanedimethanol	451	34.85	3.531		
Cyclohexanethiol	390.9				
Cyclohexanol	376.9	42.0	4.26	327	0.306
Cyclohexanone	379.9	39.5	4.0	312	0.315
Cyclohexene	287.33	42.9	4.35	292	0.281
Cyclohexylamine	341.5				
Cyclopentane	238.6	44.49	4.508	260	0.27
Cyclopentanethiol	360.4				
Cyclopentanone	353	53	5.37	268	0.314
Cyclopentene	232.9				
1-Cyclopentylheptane	406	19.2	1.94	649	0.260
1-Cyclopentylpentadecane	506.9	10.1	1.02	1096	0.256
Cyclopropane	124.7	54.2	5.49	170	0.248
<i>p</i> -Cymene	379	2.80	2.84	492	0.273
Decafluorobutane	113.3	22.93	2.323	378	0.629
<i>cis</i> -Decahydronaphthalene	429.2	31.6	3.20	480	0.288
<i>trans</i> -Decahydronaphthalene	414.0	31	3.14	480	0.288
Decane	344.6	20.8	2.11	624	0.228
Decanenitrile	348.8	32.1	3.25		
1-Decanol	413.9	22	2.23	600	0.264
1-Decene	343.3	21.89	2.218	585	0.240

TABLE 6.5 Critical Properties (*Continued*)

Substance	T_c , °C	P_c , atm	P_c , MPa	V_c , cm ³ · mol ⁻¹	ρ_c , g · cm ⁻³
Decylcyclohexane	477	13.4	1.36		
Decylcyclopentane	450	15.0	1.52		
Deuterium (equilibrium)	-234.8	16.28	1.650	60.4	0.0668
Deuterium (normal)	-234.7	16.43	1.665	60.3	0.0669
Deuterium bromide	88.8				
Deuterium chloride	50.3				
Deuterium hydride (DH)	-237.3	14.64	1.483	62.8	0.0481
Deuterium iodide	148.6				
Deuterium oxide	370.9	213.8	21.66	55.6	0.360
Diallyl sulfide	380				
Diborane	166	39.5	4.00		
1,2-Dibromo-2-chlorotrifluoro-ethane	287.6				
Dibromodifluoromethane	198.3	40.8	4.13	249	0.843
1,2-Dibromoethane	309.9	71.1	7.2	242	0.776
Dibromomethane	310	71	7.19		
1,2-Dibromotetrafluoroethane	214.7	33.49	3.393	329	0.790
Dibutylamine	334.4	30.7	3.11	517	0.250
Dibutyl ether	311.0	29.7	3.01	500	0.260
Dibutyl sulfide	377	24.7	2.50	537	0.272
1,2-Dichlorobenzene	424.2	40.5	4.10	360	0.408
1,3-Dichlorobenzene	411	38	3.85	359	0.408
1,4-Dichlorobenzene	412	39	3.95	372	0.395
Dichlorodifluoromethane	111.80	40.82	4.136	217	0.558
1,1-Dichloroethane	250	50.0	5.07	236	0.419
Dichlorodifluorosilane	95.8	34.5	3.50		
1,2-Dichloroethane	288	53	5.4	225	0.440
1,1-Dichloroethylene	222	51.3	5.20	218	0.445
cis-1,2-Dichloroethylene	271.1			224	0.433
trans-1,2-Dichloroethylene	234.4	54.4	5.51	224	0.433
Dichlorofluoromethane	178.43	51.1	5.18	196	0.522
1,2-Dichlorohexafluoropropane	172.9				
Dichloromethane	237	60.2	6.10	193	0.440
1,2-Dichloropropane	304	44	4.49	226	0.500
Dichlorosilane	176	46.1	4.67		
1,1-Dichlorotetrafluoroethane	145.5	32.6	3.30	294	0.582
1,2-Dichlorotetrafluoroethane	145.63	32.1	3.252	297	0.582
Dideuterium oxide (D ₂ O)	371.0	215.7	21.86		0.363
Diethanolamine	442.0	32.3	3.27	349	0.301
1,1-Diethoxyethane (Acetal)	254				
Diethylamine	226.84	37.3	3.758	301	0.243
1,4-Diethylbenzene	384.8	27.7	2.81	480	0.280
Diethyl disulfide	368.9				
Diethylene glycol	408	46	4.66	316	0.336
Diethyl ether	193.59	35.9	3.638	280	0.265
3,3-Diethylhexane	354.7	23.8	2.41	510	0.279
3,4-Diethylhexane	345.7	23.0	2.33	519	0.274
3,3-Diethyl-2-methylpentane	366.8	25.0	2.53	501	0.284
3,3-Diethylpentane	337	26.4	2.67		
Diethyl sulfide	284	39.1	3.96	318	0.284
Difluoroamine (HNF ₂)	130	93	9.42		
1,2-Difluorobenzene	284.2			300	0.381
cis-Difluorodiazine	-1	70	7.09		

TABLE 6.5 Critical Properties (*Continued*)

Substance	T_c , °C	P_c , atm	P_c , MPa	V_c , cm ³ · mol ⁻¹	ρ_c , g · cm ⁻³
<i>trans</i> -Difluorodiazine	-13	55	5.57		
1,1-Difluoroethane	113.6	44.4	4.50	181	0.365
1,1-Difluoroethylene	29.8	44.0	4.46	154	0.417
Dihexyl ether	384	18	1.82	720	0.259
Dihydrogen disulfide	299	58.3	5.91		
Dihydrogen heptasulfide	742	33	3.34		
Dihydrogen hexasulfide	707	36	3.65		
Dihydrogen octasulfide	767	32	3.24		
Dihydrogen pentasulfide	657	38.4	3.89		
Dihydrogen tetrasulfide	582	43.1	4.37		
Dihydrogen trisulfide	465	50.6	5.13		
Diisopentyl sulfide	391				
Diisopropyl ether	227.17	27.9	2.832	386	0.265
1,2-Dimethoxyethane	263	38.2	3.87	271	0.333
Dimethoxymethane	242.1	44.2	4.48		
<i>N,N</i> -Dimethylacetamide	364	38.7	3.92		
Dimethylamine	164.07	52.7	5.340	187	0.241
<i>N,N</i> -Dimethylaniline	414	35.8	3.63		
2,2-Dimethylbutane	215.7	30.49	3.090	359	0.240
2,3-Dimethylbutane	499.9	30.90	3.131	358	0.241
3,3-Dimethyl-2-butanone	289.8				
2,3-Dimethyl-1-butene	228	32.0	3.24	343	0.245
3,3-Dimethyl-1-butene	217	32.1	3.25	340	0.248
2,3-Dimethyl-2-butene	250.9	33.2	3.36	351	0.240
1,1-Dimethylcyclohexane	318	29.3	2.97	416	0.378
<i>cis</i> -1,2-Dimethylcyclohexane	333.0	29.0	2.94	460	0.244
<i>trans</i> -1,2-Dimethylcyclohexane	323.0	29.3	2.97	460	0.244
<i>cis</i> -1,3-Dimethylcyclohexane	317.9	29.3	2.97	450	0.249
<i>trans</i> -1,3-Dimethylcyclohexane	325	29.3	2.97	460	0.244
<i>cis</i> -1,4-Dimethylcyclohexane	325.0	29.0	2.94	460	0.244
<i>trans</i> -1,4-Dimethylcyclohexane	317.0	29.0	2.94	459	0.249
1,1-Dimethylcyclopentane	274	34.0	3.44	360	0.273
<i>cis</i> -1,2-Dimethylcyclopentane	291.7	34.0	3.44	368	0.267
<i>trans</i> -1,2-Dimethylcyclopentane	277.2	34.0	3.44	362	0.271
<i>cis</i> -1,3-Dimethylcyclopentane	318.9				
Dimethyl disulfide	59.5				
Dimethyl ether	126.9	53.0	5.37	190	0.242
<i>N,N</i> -Dimethylformamide	376.5	51.5	5.22	262	0.279
2,2-Dimethylheptane	303.7	23.19	2.350	519	0.247
2,2-Dimethylhexane	276.8	25.0	2.529	478	0.239
2,3-Dimethylhexane	290.4	25.94	2.628	468	0.244
2,4-Dimethylhexane	280.5	25.22	2.556	472	0.242
2,5-Dimethylhexane	277.0	24.54	2.487	482	0.237
3,3-Dimethylhexane	289.0	26.19	2.654	443	0.258
3,4-Dimethylhexane	295.8	26.57	2.692	466	0.245
1,1-Dimethylhydrazine	250	53.6	5.43	230	0.261
2,4-Dimethyl-3-isopentane	341.3	23.1	2.34	521	0.273
2,3-Dimethyloctane	340.1	21.6	2.19	567	0.251
2,4-Dimethyloctane	326.3	21.1	2.14	566	0.251
2,5-Dimethyloctane	330	21.2	2.15	569	0.250
2,6-Dimethyloctane	330	21.1	2.15	576	0.247
2,7-Dimethyloctane	329.8	20.7	2.10	590	0.241

TABLE 6.5 Critical Properties (*Continued*)

Substance	T_c , °C	P_c , atm	P_c , MPa	V_c , cm ³ · mol ⁻¹	ρ_c , g · cm ⁻³
3,3-Dimethyloctane	339	21.9	2.22	557	0.255
3,4-Dimethyloctane	341	22.1	2.24	551	0.258
3,5-Dimethyloctane	333.2	21.6	2.19	555	0.256
3,6-Dimethyloctane	335.2	21.6	2.19	562	0.253
4,5-Dimethyloctane	333.8	21.8	2.21	548	0.260
4,5-Dimethyloctane	339.1	22.1	2.24	546	0.261
Dimethyl oxalate	355	39.2	3.97		
2,2-Dimethylpentane	247.4	27.4	2.773	416	0.241
2,3-Dimethylpentane	264.3	28.70	2.908	393	0.255
2,4-Dimethylpentane	246.7	27.01	2.737	418	0.240
3,3-Dimethylpentane	263.3	29.07	2.946	414	0.242
2,3-Dimethylphenol	449.7	48	4.86	470	0.26
2,4-Dimethylphenol	434.5	43	4.36	509	0.24
2,5-Dimethylphenol	433.8	48	4.86	470	0.26
2,6-Dimethylphenol	427.9	42	4.26	509	0.24
3,4-Dimethylphenol	456.7	49	4.96	552	0.27
3,5-Dimethylphenol	442.5	36	3.65	611	0.25
2,2-Dimethylpropane	160.7	31.55	3.197	307	0.238
2,2-Dimethyl-1-propanol	276	39	3.95	319	
2,3-Dimethylpyridine	382.3				
2,4-Dimethylpyridine	373.9				
2,5-Dimethylpyridine	371				
2,6-Dimethylpyridine	350.7			316	0.339
3,4-Dimethylpyridine	410.7				
3,5-Dimethylpyridine	394.1				
Dimethyl sulfide	229.9	54.6	5.53	201	0.309
<i>N,N</i> -Dimethyl-1,2-toluidine	395	30.8	3.12		
1,4-Dioxane	314	51.5	5.21	238	0.370
Diphenyl ether	493.7	31	3.14		
Diphenylmethane	494	29.4	2.98		
Dipropylamine	282.7	35.8	3.63	407	0.249
Dipropyl ether	257.5	29.91	3.028		
Docosafuorodecane	269	14.3	1.45		
Dodecafluorocyclohexane	184.1	24	2.43		
Dodecafluorocyclohexene	188.7				
Dodecafluoro-1-hexene	181.3				
Dodecafluoropentane	149	20.1	2.03		
Dodecane	385	18.0	1.82	754	0.226
1-Dodecanol	405.9	19	1.92	718	0.260
1-Dodecene	384.5	18.3	1.85		
Dodecylbenzene	501	15.6	1.58	1000	0.246
Dodecylcyclopentane	477	12.8	1.30		
Ethane	32.3	48.2	4.90	148	0.203
1,2-Ethanediamine	319.8	62.1	6.29	206	0.292
1,2-Ethanediol	445	76	7.7	186	0.334
Ethanethiol	225.5	54.2	5.49	207	0.300
Ethanol	240.9	60.57	6.137	167	0.276
Ethoxybenzene	374.0	33.8	3.42		
Ethyl acetate	250.2	38.31	3.882	286	0.308
Ethyl acetoacetate	400				
Ethyl acrylate	279	37.0	3.75	320	0.313
Ethylamine	183	55.5	5.62	182	0.248
Ethylbenzene	344.00	35.61	3.609	374	0.284

TABLE 6.5 Critical Properties (*Continued*)

Substance	T_c , °C	P_c , atm	P_c , MPa	V_c , cm ³ · mol ⁻¹	ρ_c , g · cm ⁻³
Ethyl benzoate	424	32	3.24	451	0.111
Ethylbutanoate	293	30.2	3.06	421	0.28
2-Ethyl-1-butanol	145.7				
Ethyl crotonate	326				
Ethylcyclohexane	336	29.9	3.03	450	0.249
Ethylcyclopentane	296.4	33.5	3.39	375	0.262
3-Ethyl-2,2-dimethylhexane	338.6	22.8	2.31	526	0.271
4-Ethyl-2,2-dimethylhexane	321.5	21.9	2.22	539	0.264
3-Ethyl-2,3-dimethylhexane	353.7	23.9	2.42	516	0.276
4-Ethyl-2,3-dimethylhexane	344.2	23.1	2.34	524	0.271
3-Ethyl-2,4-dimethylhexane	343.0	23.1	2.34	522	0.273
4-Ethyl-2,4-dimethylhexane	347.8	24.4	2.47	524	0.271
3-Ethyl-2,5-dimethylhexane	330.4	22.1	2.24	537	0.265
3-Ethyl-3,4-dimethylhexane	351.4	23.9	2.42	511	0.278
Ethylene	9.3	49.7	5.036	129	0.218
Ethylene glycol dimethyl ether	263	38.2	3.87	271	0.333
Ethylene glycol ethyl ether acetate	334.2	31.25	3.166	443	0.298
Ethylene glycol monobutyl ether	360.8			424	0.279
Ethylene oxide	196	71.0	7.275	140	0.314
Ethyl formate	235.4	46.8	4.74	229	0.323
3-Ethylhexane	292.4	25.74	2.608	455	0.251
2-Ethyl-1-hexanol	367.5	27.2	2.76	494	0.264
Ethyl isopentanoate	315				
Ethyl isopropyl ether	217.2				
2-Ethyl-1-methylbenzene	378	30.0	3.04	460	0.26
3-Ethyl-1-methylbenzene	364	28.0	2.84	490	0.24
4-Ethyl-1-methylbenzene	367	29.0	2.94	470	0.26
Ethyl 3-methylbutanoate	314.9				
1-Ethyl-1-methylcyclopentane	319	29.5	2.99		
Ethyl methyl ether	164.8	43.4	4.40	221	0.272
3-Ethyl-2-methylheptane	337.8	22.0	2.23	544	0.262
4-Ethyl-2-methylheptane	328.7	21.6	2.19	545	0.261
5-Ethyl-2-methylheptane	333.6	21.6	2.19	555	0.256
3-Ethyl-3-methylheptane	347.0	22.8	2.31	532	0.267
4-Ethyl-3-methylheptane	341.2	22.5	2.28	530	0.269
5-Ethyl-3-methylheptane	333.5	22.0	2.23	541	0.263
3-Ethyl-4-methylheptane	342.4	22.5	2.28	533	0.267
4-Ethyl-4-methylheptane	342.4	22.8	2.31	525	0.271
Ethyl methyl ketone	262.4	41.0	4.154	267	0.270
3-Ethyl-2-methylpentane	294.0	26.65	2.700	443	0.258
3-Ethyl-3-methylpentane	303.5	27.71	2.808	455	0.351
Ethyl 2-methylpropanoate	280	30	3.04	410	0.28
Ethyl methyl sulfide	260	42	4.26		
2-Ethyl naphthalene	502	31.0	3.14	521	0.300
Ethyl nonanoate	401				
3-Ethyl octane	340	21.6	2.19	561	0.241
4-Ethyl octane	337	21.5	2.18	552	0.258
Ethyl octanoate	386				
3-Ethylpentane	267.6	28.53	2.891	416	0.241
1,2-Ethylphenol	429.9				
1,3-Ethylphenol	443.3				

TABLE 6.5 Critical Properties (*Continued*)

Substance	T_c , °C	P_c , atm	P_c , MPa	V_c , cm ³ · mol ⁻¹	ρ_c , g · cm ⁻³
1,4-Ethylphenol	443.3				
Ethyl propanoate	272.9	33.18	3.362	345	0.296
Ethyl propyl ether	227.1	32.1	3.25	244	0.361
<i>m</i> -Ethyltoluene	364.0	28.1	2.837	490	0.245
<i>o</i> -Ethyltoluene	378.0	30.1	3.04	460	0.261
<i>p</i> -Ethyltoluene	367	29.0	2.94	479	0.256
3-Ethyl-2,2,3-trimethyl-pentane	372.9	25.4	2.57	503	0.283
3-Ethyl-2,2,4-trimethyl-pentane	342.2	23.4	2.37	518	0.275
3-Ethyl-2,3,4-trimethyl-pentane	369.2	25.1	2.54	506	0.281
Ethyl vinyl ether	202	40.17	4.07	260	0.277
Fluorine	-129.0	51.47	5.215	66.2	0.574
Fluorobenzene	286.94	44.91	4.551	357	0.269
Fluoroethane	102.2	49.6	5.03	169	0.284
Fluoromethane	44.7	58.0	5.88	124	0.274
4-Fluorotoluene	316.4				
Formaldehyde	135	65	6.6	105	0.286
Formic acid	315				
2-Furaldehyde	397	58.1	5.89		
Furan	217.1	54.3	5.50	218	0.312
Germanium tetrachloride	276.9	38	3.85	330	0.650
Glycerol	453	66	6.69	255	0.361
Hafnium tetrabromide	473			415	1.20
Hafnium tetrachloride	450	57.0	5.86	304	1.05
Hafnium tetraiodide	643			528	1.30
Helium (equilibrium)	-267.96	2.261	0.2289		0.06930
Helium-3	-269.85	1.13	0.1182	72.5	0.0414
Helium-4	-267.96	2.24	0.227	57.3	0.0698
Heptadecane	460	13.0	1.32	1006	0.140
1-Heptadecanol	736	14.0	1.42	960	0.267
Heptane	267.1	27.0	2.74	428	0.232
1-Heptanol	359.5	30.18	3.058	435	0.267
2-Heptanol	335.2	29.81	3.021	432	0.269
3-Heptanol	332.3				
2-Heptanone	338.4	33.91	3.436	421	0.271
1-Heptene	264.2	28.83	2.921	402	0.246
Heptylcyclopentane	406	19.2	1.945		
Hexadecafluoroheptane	201.7	16.0	1.62	664	0.584
Hexadecane	444	14	1.42	930	0.243
1-Hexadecene	444	13.2	1.34	933	0.241
Hexadecylcyclopentane	518	9.6	0.97		
1,5-Hexadiene	234	34	3.44	328	0.250
Hexafluoroacetone	84.1	29.0	2.94	329	0.505
Hexafluorobenzene	243.6	32.30	3.273	335	0.505
Hexafluoroethane	19.7			224	0.617
Hexamethylbenzene	494			600	0.271
Hexane	234.5	29.85	3.025	368	0.233
Hexanenitrile	360.7	32.57	3.30		
Hexanoic acid	389	31.6	3.20		
1-Hexanol	337.2	33.72	3.417	381	0.268
2-Hexanol	312.8	32.67	3.310		

TABLE 6.5 Critical Properties (*Continued*)

Substance	T_c , °C	P_c , atm	P_c , MPa	V_c , cm ³ · mol ⁻¹	ρ_c , g · cm ⁻³
3-Hexanol	309.3	33.2	3.36		
2-Hexanone	313.9	32.8	3.32		
3-Hexanone	309.7	32.76	3.320		
1-Hexene	231.0	31.64	3.206	348	0.242
<i>cis</i> -2-Hexene	245	32.4	3.28	351	0.240
<i>trans</i> -2-Hexene	243	32.3	3.27	351	0.240
<i>cis</i> -3-Hexene	244	32.4	3.28	350	0.240
<i>trans</i> -3-Hexene	246.8	32.1	3.25	350	0.240
Hexylcyclopentane	387.0	21.1	2.14		
Hydrazine	380	14.5	1.47	96.1	0.333
Hydrogen (equilibrium)	-240.17	12.77	1.294	65.4	0.0308
Hydrogen (normal)	-239.91	12.8	1.297	65.0	0.0310
Hydrogen bromide	89.8	84.4	8.55	100.0	0.809
Hydrogen chloride	51.40	82.0	8.31	81.0	0.45
Hydrogen cyanide	183.5	53.2	5.39	139	0.195
Hydrogen deuteride	-237.25	14.64	1.483	62.8	0.048
Hydrogen fluoride	188	64	6.5	69	0.29
Hydrogen iodide	150.7	82.0	8.31	131	0.976
Hydrogen selenide	137	88	8.9		
Hydrogen sulfide	100.4	88.2	8.94	98.5	0.31
Icosafluorononane	251	15.4	1.56		
Icosane	494	10.3	1.04	1190	0.237
1-Icosanol	497	12.0	1.22		
Indane	411.8	39.0	3.95	381	0.310
Iodine	546	115	11.7	155	0.164
Iodobenzene	448	44.6	4.52	351	0.581
Iodoethane	281.0				
Iodomethane	255	65	6.59	190	0.75
1-Iodopropane	323				
Isobutyl acetate	288	31.2	3.16	414	0.281
Isobutylamine	246	40.2	4.07	284	0.258
Isobutylbenzene	377	30.1	3.05	480	0.280
Isobutyl bromide	294.1				
Isobutyl butanoate	338				
Isobutylcyclohexane	386	30.8	3.12		
Isobutyl formate	278	38.3	3.88	350	0.29
Isobutyl isobutanoate	329				
Isobutyl 3-methylbutanoate	348				
Isobutyl propanoate	319				
Isopentyl acetate	326				
Isopentyl butanoate	346				
Isopentyl propanoate	338				
Isopropyl acetate	258				
Isopropylamine	198.7	44.8	4.54	221	0.267
Isopropylbenzene	357.9	31.67	3.209	429	0.281
Isopropylcycloheptane	334.5				
Isopropylcyclohexane	367	28	2.84		
Isopropylcyclopentane	328	29.6	3.00		
4-Isopropylheptane	334.5	22.0	2.23	537	0.265
Isopropylmethylaniline	217.6				
2-Isopropyl-1-methylbenzene	397	28.6	2.90		
3-Isopropyl-1-methylbenzene	393	29.0	2.94		
4-Isopropyl-1-methylbenzene	380	27.9	2.83		

TABLE 6.5 Critical Properties (*Continued*)

Substance	T_c , °C	P_c , atm	P_c , MPa	V_c , cm ³ · mol ⁻¹	ρ_c , g · cm ⁻³
3-Isopropyl-2-methylhexane	359.3	22.6	2.29	529	0.269
Isopropyl methyl sulfide	276.4				
Isoquinoline	530	50.3	5.10	374	0.345
Isoxazole	278.9				
Ketene	380	64	6.5	145	0.290
Krypton	-63.75	54.3	5.50	91.2	0.9085
Mercury	1477	1587	160.8		
Mercury(II) bromide	789				
Mercury(II) chloride	700				
Mercury(II) iodide	799				
Methane	-82.60	45.44	4.604	99.0	0.162
Methanethiol	196.8	71.4	7.23	145	0.332
Methanol	239.4	79.78	8.084	118	0.272
Methoxybenzene	372.5	41.9	4.25		0.321
Methyl acetamide	417				
Methyl acetate	233.40	46.9	4.75	228	0.325
Methyl acrylate	263	42	4.26	265	0.325
Methylamine	157.6	75.14	7.614	140	0.222
N-Methylaniline	428	51.3	5.20	373	0.287
Methyl benzoate	438	36	3.65	396	0.344
2-Methyl-1,3-butadiene	211	38.0	3.85	276	0.247
3-Methyl-1,3-butadiene	223	40.6	4.11	267	0.255
2-Methylbutane	187.3	33.4	3.38	306	0.236
2-Methyl-1-butanethiol	318.8				
2-Methyl-2-butanethiol	297.0				
Methyl butanoate	281.3	34.3	3.475	340	0.300
3-Methylbutanoic acid	356	33.6	3.40		
2-Methyl-1-butanol	302.3	38.9	3.94	322	0.274
3-Methyl-1-butanol	304.1	38.8	3.93	329	0.268
2-Methyl-2-butanol	270.6	36.6	3.71	319	0.276
3-Methyl-2-butanol	283.0	38.2	3.87		
3-Methyl-2-butanone	280.3	38.0	3.85	310	0.278
2-Methyl-1-butene	196.9	34.0	3.445	294	0.239
3-Methyl-1-butene	191.6	34.7	3.52	300	0.234
2-Methyl-2-butene	207.9	34.0	3.445	318	0.221
Methylcyclohexane	299.1	34.26	3.471	368	0.267
Methylcyclopentane	259.58	37.35	3.784	319	0.264
Methyl dodecanoate	439			758	0.283
N-Methylethylamine	223.5	36.6	3.71	243	0.243
Methyl formate	214.1	59.20	5.998	172	0.349
2-Methylfuran	254	46.6	4.72	247	0.333
2-Methylheptane	286.6	24.52	2.484	488	0.234
3-Methylheptane	290.6	25.13	2.546	464	0.246
4-Methylheptane	288.7	25.09	2.542	476	0.240
2-Methylhexane	257.3	26.98	2.734	421	0.238
3-Methylhexane	262.2	27.77	2.814	404	0.248
Methylhydrazine	294	79.3	8.035	271	0.170
Methyl 2-hydroxybenzoate	436				
Methyl isobutanoate	267.7	33.9	3.43	339	0.301
Methyl isocyanate	218	55	5.57		
1-Methylnaphthalene	499	35.5	3.60	445	0.320
2-Methylnaphthalene	488	34.6	3.51	462	0.308
2-Methyloctane	313.9	22.80	2.310		

TABLE 6.5 Critical Properties (*Continued*)

Substance	T_c , °C	P_c , atm	P_c , MPa	V_c , cm ³ · mol ⁻¹	ρ_c , g · cm ⁻³
2-Methylpentane	224.6	29.91	3.031	367	0.235
3-Methylpentane	231.4	30.85	3.126	367	0.235
2-Methyl-2,4-pentanediol	405	33.9	3.43		
Methyl pentanoate	294				
2-Methyl-2-pentanol	286.4				
2-Methyl-3-pentanol	302.9	34.1	3.46		
3-Methyl-3-pentanol	302.5	34.7	3.52		
4-Methyl-1-pentanol	330.4				
4-Methyl-2-pentanol	301.3	42.4	4.30	380	0.269
3-Methyl-2-pentanone	298.8				
4-Methyl-2-pentanone	298	32.3	3.27	371	0.270
2-Methyl-2-pentene	245	32.4	3.28	351	0.240
<i>cis</i> -3-Methyl-2-pentene	245	32.4	3.28	351	0.240
<i>trans</i> -3-Methyl-2-pentene	248	32.3	3.27	350	0.240
<i>cis</i> -4-Methyl-2-pentene	217	30	3.04	360	0.234
<i>trans</i> -4-Methyl-2-pentene	220	30	3.04	360	0.234
2-Methylpropanal	240	41	4.15	274	0.263
2-Methyl-1-propanamine	246	40.2	4.07	278	0.263
<i>N</i> -Methylpropanamide	412				
2-Methylpropane	134.70	35.83	3.630	263	0.221
2-Methyl-1-propanethiol	286.4				
2-Methyl-2-propanethiol	257.0				
Methyl propanoate	257.5	39.5	4.00	282	0.312
2-Methylpropanoic acid	332	36.5	3.7	292	0.302
2-Methyl-1-propanol	274.6	42.39	4.295	273	0.272
2-Methyl-2-propanol	233.1	39.20	3.972	275	0.270
2-Methylpropene	144.73	39.48	4.000	239	0.235
2-Methylpropyl acetate	288	31.2	3.16	414	0.281
Methyl propyl ether	203.2				
Methyl propyl sulfide	301.0				
2-Methylpyridine	347.9	45.4	4.60	292	0.319
3-Methylpyridine	371.9	44.2	4.48	288	0.323
4-Methylpyridine	373	46.4	4.70	292	0.319
1-Methyl-2-pyrrolidinone	448.7			311	0.319
1-Methylstyrene	381	33.6	3.40	397	0.298
2-Methyltetrahydrofuran	264	37.1	3.76	267	0.322
2-Methylthiophene	333.1	47.9	4.85	275	0.356
3-Methylthiophene	337.7	48.9	4.95	275	0.356
Methyl vinyl ether	163	47	4.76	205	0.283
Morpholine	345	54	54.7	253	0.344
Naphthalene	475.3	39.98	4.051	407	0.31
Neon	-228.71	27.2	2.77	41.7	0.4835
Niobium pentabromide	737			469	1.05
Niobium pentachloride	534			400	0.68
Niobium pentafluoride	464	62	6.28	155	1.21
Nitric oxide	-92.9	64.6	6.55	58	0.52
Nitrobenzene	459				
Nitroethane	284	37	3.75		
Nitrogen-14	146.94	33.5	3.39	89.5	0.313
Nitrogen-15	146.8	33.5	3.39	90.4	0.332
Nitrogen chloride difluoride	64.3	50.8	5.15		
Nitrogen dioxide (equilibrium)	158.2	100	10.1	170	0.557
Nitrogen trideuteride (ND ₃)	132.4				

TABLE 6.5 Critical Properties (*Continued*)

Substance	T_c , °C	P_c , atm	P_c , MPa	V_c , cm ³ · mol ⁻¹	ρ_c , g · cm ⁻³
Nitrogen trifluoride	-39.3	44.7	4.53		
Nitromethane	315	57.9	5.87	173	0.352
1-Nitropropane	402.0				
2-Nitropropane	344.8				
Nitrous oxide	36.434	71.596	7.2545	97.4	0.4525
Nitrosyl chloride	167	90	9.12	139	0.471
Nitryl fluoride	76.3				
Nonadecane	483	11.0	1.12	1130	0.238
Nonane	321.5	22.6	2.29	555	0.231
Nonanoic acid	438	23.7	2.40		
1-Nonanol	404			546	0.264
1-Nonene	319	23.1	2.34	580	0.218
Nonylbenzene	468	18.7	1.89	790	0.259
Nonylcyclopentane	437.4	16.3	1.65		
Octadecafluorooctane	229	16.4	1.66		
Octadecane	472.3	12.73	1.29	1070	0.238
1-Octadecanol	474	14	1.42		
1-Octadecene	466	11.2	1.13		
Octafluorocyclobutane	115.31	27.48	2.784	325	0.616
Octafluoronaphthalene	399.9				
Octafluoropropane	72.7	26.5	2.69	299	0.628
Octamethylcyclotetrasiloxane	313	13.2	1.33	970	0.306
Octane	295.6	24.6	2.49	492	0.232
Octanenitrile	401.3	28.1	2.85		
Octanoic acid	422	26.1	2.64		
1-Octanol	379.4	27.41	2.777	490	0.266
2-Octanol	356.5	27.18	2.754	494	0.278
1-Octene	293.6	26.40	2.675	464	0.242
<i>cis</i> -2-Octene	307	27.3	2.77		
Octylcyclopentane	421	17.7	1.79		
Osmium tetroxide	132	170	17.2		
Oxygen	-118.56	49.77	5.043	73.4	0.436
Oxygen difluoride	-58.0	48.9	4.95	97.7	0.553
Ozone	-12.10	53.8	5.45	88.9	0.540
Pentachloroethane	373.0				
Pentadecane	433.9	15	1.52	880	0.241
1-Pentadecene	431	14.4	1.46		
Pentadecylcyclopentane	507	10.1	1.02		
1,2-Pentadiene	230	40.2	4.07	276	0.248
<i>cis</i> -1,3-Pentadiene	223	39.4	3.99	275	0.248
1,4-Pentadiene	205	37.4	3.79	276	0.248
Pentafluorobenzene	258.9	34.7	3.52		
2,3,4,5,6-Pentafluorotoluene	275.5				
2,2,3,3,4-Pentamethyl- pentane	370.7	25.5	2.58	508	0.280
2,2,3,4,4-Pentamethyl- pentane	354.2	23.7	2.40	521	0.273
Pentanal	281	35	3.55	333	0.259
Pentane	196.6	33.26	3.370	311	0.237
Pentanenitrile	337.2	35.3	3.58		
Pentanethiol	324.6				
Pentanoic acid	370	35.3	3.58	340	0.300
1-Pentanol	315.0	38.38	3.889	326	0.270
2-Pentanol	287.3	36.27	3.675		

TABLE 6.5 Critical Properties (*Continued*)

Substance	T_c , °C	P_c , atm	P_c , MPa	V_c , cm ³ · mol ⁻¹	ρ_c , g · cm ⁻³
3-Pentanol	286.5				
2-Pentanone	287.93	36.46	3.694	301	0.286
3-Pentanone	288.31	36.9	3.729	336	0.256
1-Pentene	191.63	34.81	3.527	293	0.239
<i>cis</i> -2-Pentene	202	36.4	3.69		
<i>trans</i> -2-Pentene	198	34.7	3.52	304	0.231
Pentyl acetate	332				
Pentylbenzene	406.8	25.7	2.60	550	0.269
Pentyl formate	303				
1-Pentyne	220.3	40	4.05	278	0.245
Perchloryl fluoride	95.3	53.0	5.37	161	0.637
Phenanthrene	596			554	0.322
Phenol	421.1	60.5	6.13	229	0.41
1-Phenylhexadecane	535	12.7	1.29	1200	0.252
1-Phenylpentadecane	526.9	13.3	1.35	1140	0.253
1-Phenyltetradecane	519	14.0	1.42	1110	0.247
Phosgene	182	56	5.67	190	0.52
Phosphine	51.3	64.5	6.54		
Phosphine- d_3	50.4				
Phosphonium chloride	49.1	72.7	7.37		
Phosphorus	721				
Phosphorus bromide difluoride	113				
Phosphorus chloride difluoride	89.2	44.6	4.52		
Phosphorus dibromide fluoride	254				
Phosphorus dichloride fluoride	189.9	49.3	5.00		
Phosphorus pentachloride	372				
Phosphorus trichloride	290			260	0.528
Phosphorus trifluoride	-1.9	42.7	4.33		
Phosphoryl chloride difluoride	150.7	43.4	4.40		
Phosphoryl trichloride	329				
Phosphoryl trifluoride	73.4	41.8	4.24		
Phthalic anhydride	537	47	4.76	368	0.402
Piperidine	321.0	48.8	4.94	288	0.296
Propadiene	120	54.0	5.47	162	0.247
Propanal	231.3	52.0	5.27	204	0.285
Propane	96.68	41.92	4.248	200	0.217
1,2-Propanediol	352	60	6.08	237	0.321
1,3-Propanediol	385	59	5.98	241	0.316
Propanenitrile	288.2	42.0	4.26	230	0.240
1-Propanethiol	262.5				
2-Propanethiol	244.2				
Propanoic acid	331	44.7	4.53	222	0.32
1-Propanol	263.7	51.01	5.169	218.5	0.275
2-Propanol	235.2	47.02	4.764	220	0.273
2-Propenal	233	51	5.17	197	0.285
Propene	91.9	45.6	4.62	181	0.233
2-Propen-1-ol	272.0			208	0.279
Propyl acetate	276.6	33.2	3.36	345	0.296
Propylamine	223.9	46.6	4.72	233	0.254
Propylbenzene	365.20	31.58	3.200	440	0.273
Propyl butanoate	327				
Propylcyclopentane	358.7	29.6	3.00	425	0.264
Propylcyclohexane	336.7	27.7	2.81		
Propylene oxide	209.1	48.6	4.92	186	0.312

TABLE 6.5 Critical Properties (*Continued*)

Substance	T_c , °C	P_c , atm	P_c , MPa	V_c , cm ³ · mol ⁻¹	ρ_c , g · cm ⁻³
Propyl formate	264.9	40.1	4.06	285	0.309
Propyl 2-methylpropanoate	316				
Propyl 3-methylpropanoate	336				
Propyl propanoate	305				
Propyne	129.3	55.5	5.62	164	0.245
Pyridine	346.9	55.96	5.67	243	0.325
Pyrrole	366.6	62.6	6.34	200	0.335
Pyrrolidine	295.1	55.2	5.59	238	0.300
Quinoline	509	48.0	4.86	437	0.300
Radon	104	62	6.28	139	1.6
Rhenium(VII) oxide	669			334	
Rhenium(VI) oxide tetrachloride	508			161	0.95
Rubidium	1832			250	0.34
Selenium	1493				
Silane	-3.5	47.8	4.84		
Silicon chloride trifluoride	34.5	34.2	3.47		
Silicon tetrabromide	390				
Silicon tetrachloride	234	37	3.75	326	0.521
Silicon tetrafluoride	-14.0	36.7	3.72		
Silicon trichloride fluoride	165.4	35.3	3.57		
Spiro[2.2]pentane	233.3				
Styrene	363.8	36.3	3.68	347	0.300
Sulfur	1041	116	11.7		
Sulfur dioxide	157.7	77.8	7.88	122	0.5240
Sulfur hexafluoride	45.6	37.1	3.76	198	0.734
Sulfur tetrafluoride	91.7				
Sulfur trioxide	217.9	81	8.2	130	0.633
Tantalum pentabromide	701			461	1.26
Tantalum pentachloride	494			400	0.89
1,2-Terphenyl	617.9	38.5	3.90	755	0.305
1,3-Terphenyl	651.7	34.6	3.51	768	0.300
1,4-Terphenyl	652.9	32.8	3.32	762	0.302
1,1,2,2-Tetrachlorodifluoroethane	278	34	3.44	371	0.549
1,1,2,2-Tetrachloroethane	388.00				
Tetrachloroethylene	347.1	44.3	4.49	290	0.572
Tetrachloromethane	283.5	44.57	4.516	276	0.557
Tetradecafluoro-1-heptene	205.1				
Tetradecafluorohexane	174.5	18.8	1.90		
Tetradecafluoromethylcyclohexane	213.7	23	2.33		
Tetradecane	420.9	16	1.62	830	0.239
1-Tetradecene	416	15.4	1.56		
Tetradecylcyclopentane	499	11.1	1.12		
Tetraethylsilane	330.6	25.68	2.602		
Tetrafluoroethylene	33.4	38.9	3.91	175	0.58
Tetrafluorohydrazine	33.3	37	3.75		
Tetrafluoromethane	-45.5	36.9	3.74	140	0.629
Tetrahydrofuran	267.0	51.22	5.19	224	0.322
1,2,3,4-Tetrahydronaphthalene	447	36.0	3.65	408	0.324
Tetrahydropyran	299.1	47.1	4.77	263	0.328
Tetrahydrothiophene	358.9				
1,2,4,5-Tetramethylbenzene	402	29	2.94	480	0.280
2,2,3,3-Tetramethylbutane	294.7	28.3	2.87	461	0.248
2,2,3,3-Tetramethylhexane	350.0	24.8	2.51	573	0.248

TABLE 6.5 Critical Properties (*Continued*)

Substance	T_c , °C	P_c , atm	P_c , MPa	V_c , cm ³ · mol ⁻¹	ρ_c , g · cm ⁻³
2,2,3,4-Tetramethylhexane	347.3	23.4	2.37	525	0.271
2,2,3,5-Tetramethylhexane	328.2	22.4	2.27	540	0.263
2,2,4,4-Tetramethylhexane	337.1	22.2	2.25	535	0.266
2,2,4,5-Tetramethylhexane	325.4	21.9	2.22	544	0.262
2,2,5,5-Tetramethylhexane	308.4	21.6	2.19	573	0.248
2,3,3,4-Tetramethylhexane	360.0	24.5	2.48	514	0.277
2,3,3,5-Tetramethylhexane	337.0	22.9	2.32	531	0.268
2,3,4,4-Tetramethylhexane	353.5	23.9	2.42	518	0.275
2,3,4,5-Tetramethylhexane	340.1	23.1	2.34	530	0.269
3,3,4,4-Tetramethylhexane	373.6	25.4	2.57	506	0.281
2,2,3,3-Tetramethylpentane	334.6	27.05	2.741		
2,2,3,4-Tetramethylpentane	319.6	25.68	2.602		
2,2,4,4-Tetramethylpentane	301.6	24.52	2.485		
2,3,3,4-Tetramethylpentane	334.6	26.80	2.716		
Tetramethylsilane	175.49	27.84	2.821	362	0.244
Thiacyclopentane	358.8				
2-Thiapropane	230.0	54.6	5.53	201	0.309
Thiophene	306.3	56.16	5.69	219	0.385
Thiophenol	416.4				
Thymol	425				
Tin(IV) chloride	318.7	37.0	3.75	351	0.742
Titanium tetrachloride	365	46	4.66	340	0.558
Toluene	318.60	40.54	4.108	316	0.292
1,2-Toluidine	434	43.1	4.37	343	0.312
1,3-Toluidine	434	42.2	4.28	343	0.312
1,4-Toluidine	433	45.2	4.58		
Toluonitrile	450				
Tributoxyborane	472	19.6	1.99	863	0.267
Tributylamine	365.3	18	1.82		
1,1,1-Trichloroethane	272	42.4	4.30		
1,1,2-Trichloroethane	329	41	4.15	294	0.454
Trichloroethylene	271.1	49.5	5.02	256	0.513
Trichlorofluoromethane	198.1	43.5	4.41	248	0.554
Trichlorofluorosilane	165.4	35.3	3.57		
Trichloromethane	263.3	54.0	5.47	239	0.500
Trichloromethylsilane	244	32.4	3.28	348	0.430
1,2,3-Trichloropropane	378	39	3.95	348	0.424
1,2,2-Trichlorotrifluoroethane	214.2	33.7	3.42	325	0.576
Tridecane	402	16.6	1.68	780	0.236
1-Tridecene	401	16.8	1.70		
Tridecylcyclopentane	488	11.9	1.21		
Triethanolamine	514.3	24.2	2.45		
Triethylamine	262.5	29.92	3.032	389	0.26
Trifluoroacetic acid	218.2	32.15	3.258	204	0.559
Trifluoroamine oxide (NOF ₃)	29.5			169	0.593
1,1,1-Trifluoroethane	73.2	37.1	3.76	194	0.434
Trifluoromethane	25.8	47.7	4.83	133	0.525
(Trifluoromethyl)benzene	286.8				
Trimethylamine	159.64	40.34	4.087	254	0.233
1,2,3-Trimethylbenzene	391.4	34.09	3.454	430	0.280
1,2,4-Trimethylbenzene	376.0	31.90	3.232	430	0.280
1,3,5-Trimethylbenzene	364.2	30.86	3.127	433	0.278
2,2,3-Trimethylbutane	258.1	29.15	2.954	398	0.252
2,2,3-Trimethyl-1-butene	260	28.6	2.90	400	0.245

TABLE 6.5 Critical Properties (*Continued*)

Substance	T_c , °C	P_c , atm	P_c , MPa	V_c , cm ³ · mol ⁻¹	ρ_c , g · cm ⁻³
1,1,2-Trimethylcyclopentane	306.4	29.0	2.94		
1,1,3-Trimethylcyclopentane	296.4	27.9	2.83		
<i>cis,trans,cis</i> -1,2,4-Trimethyl- cyclopentane	298	27.7	2.81		
<i>cis,cis,trans</i> -1,2,4-Trimethyl- cyclopentane	306	28.4	2.88		
2,2,3-Trimethylheptane	338.6	22.4	2.27	546	0.261
2,2,4-Trimethylheptane	321.4	21.4	2.17	552	0.258
2,2,5-Trimethylheptane	325.0	21.4	2.17	559	0.256
2,2,6-Trimethylheptane	320.3	21.0	2.13	573	0.248
2,3,3-Trimethylheptane	344.4	22.9	2.32	538	0.265
2,3,4-Trimethylheptane	340.6	22.6	2.29	538	0.265
2,3,5-Trimethylheptane	339.7	22.1	2.24	547	0.260
2,3,6-Trimethylheptane	331.0	21.6	2.19	560	0.254
2,4,4-Trimethylheptane	327.2	21.9	2.22	541	0.263
2,4,5-Trimethylheptane	333.8	22.1	2.24	544	0.262
2,4,6-Trimethylheptane	317.2	21.2	2.15	560	0.254
2,5,5-Trimethylheptane	329.8	21.9	2.22	550	0.259
3,3,4-Trimethylheptane	349.4	23.4	2.37	526	0.271
3,3,5-Trimethylheptane	336.5	22.9	2.32	579	0.246
3,4,4-Trimethylheptane	347.8	23.4	2.37	524	0.271
3,4,5-Trimethylheptane	339.7	22.1	2.24	547	0.261
2,2,3-Trimethylhexane	315	24.6	2.49		
2,2,4-Trimethylhexane	300.6	23.4	2.37		
2,2,5-Trimethylhexane	295	23.0	2.33	519	0.247
2,4,7-Trimethyloctane	335.7				
2,2,3-Trimethylpentane	290.4	26.94	2.730	436	0.262
2,2,4-Trimethylpentane	270.9	25.34	2.568	468	0.244
2,3,3-Trimethylpentane	300.5	27.83	2.820	455	0.251
2,3,4-Trimethylpentane	293.4	26.94	2.730	461	0.248
2,2,4-Trimethyl-1,3-pentanediol	398	25.6	2.59	364.6	0.4010
2,3,6-Trimethylpyridine	381.4				
2,4,6-Trimethylpyridine	379.9				
2,4,6-Trimethyl-1,3,5-trioxane	290				
Tungsten(VI) oxide tetra- chloride	509			338	1.01
1 <i>H</i> -Undecafluoropentane	170.8				
Undecane	365.7	19.4	1.97	657	0.238
1-Undecene	364	19.7	2.00		0.240
Uranium hexafluoride	232.7	45.5	4.61	250	1.41
Vinyl acetate	228.4	22.4	2.27	265	0.325
Vinyl chloride	156.6	55.3	5.60	169	0.370
Vinyl fluoride	54.7	51.7	5.24	114	0.320
Vinyl formate	202	57	5.78	210	0.343
Water	374.2	217.6	22.04	56.0	0.325
Xenon	16.583	57.64	5.84	118	1.105
1,2-Xylene	357.2	36.83	3.732	370	0.288
1,3-Xylene	343.9	34.95	3.541	375	0.282
1,4-Xylene	343.1	34.65	3.511	379	0.280
Zirconium tetrabromide	532			415	0.99
Zirconium tetrachloride	505	56.9	5.77	319	0.730
Zirconium tetraiodide	687			528	1.13