

Data: Do not write answers here!

Chemistry BC3252y

Fundamental Constants

Avogadro's Number $N_A = 6.0221367 \times 10^{23} \text{ mol}^{-1}$

Gas Constant $R = 0.082058 \text{ L}\cdot\text{atm}/\text{K}\cdot\text{mol} = 8.314472 \text{ J}/\text{K}\cdot\text{mol} = 1.9872 \text{ cal}/\text{K}\cdot\text{mol}$

Boltzmann constant $k_B = R/N_A = 1.3806578 \times 10^{-23} \text{ J}/\text{K}$

Planck's constant $h = 6.6260755 \times 10^{-34} \text{ J}\cdot\text{sec}$

speed of light $c = 2.9979 \times 10^8 \text{ m}/\text{s}$

acceleration of gravity on the surface of earth $g = 9.8 \text{ m}/\text{s}^2$

Conversion Factors

Volume 1 liter (L) = 1000 cm³

Pressure 1 atmosphere (atm) = 1.01325 x 10⁵ Pa = 760 mmHg

Temperature 0 degrees Celsius (°C) = 273.15 K

Energy 1 calorie (cal) = 4.184 Joules

101.325 Joule = 1 L·atm

RT at exactly 25°C = 2.47897 kJ/mole

Mass 1 amu = 1.6605402 x 10⁻²⁷ kg

$\ln x = 2.302585 \log x = \ln(10) \log x$

Average Bond Enthalpies (kJ/mole)

	H-	C-	O-	C=
H	436	413	463	
C	413	348	351	615
N	391	292		615
Cl	432	328	203	

THERMODYNAMIC DATA

CHEMISTRY BC3252y

Data at 25°C and chemical standard state (gases: one atmosphere, solutions: one molar)

SUBSTANCE	$\Delta_f H_m^\circ$ (kJ/mole)	S_m° (J/K-mole)	$\Delta_f G_m^\circ$ (kJ/mole)
H(g)	217.965	114.60	203.263
Hg(g)	61.317	174.85	31.853
C(g)	716.682	671.29	157.99
CO(g)	-110.525	197.56	-137.15
CO ₂ (g)	-393.51	213.64	-394.36
CH ₄ (g)	-74.81	186.15	-50.75
C ₂ H ₂ (g)	226.73	200.83	209.20
C ₂ H ₄ (g)	52.26	219.45	68.12
C ₂ H ₆ (g)	-84.68	229.49	-32.89
C ₆ H ₆ (g)	82.927	269.2	129.66
cyclopropane: c-C ₃ H ₆ (g)	53.30	237.55	104.45
C ₃ H ₈ (g)	-103.85	269.91	-23.49
CH ₃ OH(g)	-200.66	239.70	-162.01
CH ₃ CH ₂ OH(l)	-277.69	160.7	-174.89
CH ₃ COCH ₃ (g)	-184.05	266.27	-112.67
CH ₃ COCH ₃ (l)	-248.1	200.4	-155.39
Cl(g)	121.68	165.09	105.71
HCl(g)	-92.307	186.80	-95.30
LiCl(s)	-408.61	59.33	-384.39
Li ⁺ (aq)	-278.49	13.4	-293.31
NH ₄ ⁺ (aq)	-123.51	113.4	-79.31
N ₂ H ₄ (g)	95.40	238.47	159.35
NH ₄ NO ₃ (s)	-365.56	151.08	-184.02
NO ₃ ⁻ (aq)	-205.0	146.4	-180.74
O(g)	249.17	231.76	160.95
O ₃ (g)	142.7	238.82	163.2
OH(g)	38.99	183.71	
H ₂ O(g)	-241.82	188.72	-228.59
H ₂ O(l)	-285.83	69.91	-237.18
H ₂ O ₂ (g)	-136.11	232.95	

ELEMENT	S° (J/K-mol)	ELEMENT	S° (J/K-mol)	ELEMENT	S° (J/K-mol)
Al(s)	28.33	Cl ₂ (g)	222.96	Fe(s)	27.28
Br ₂ (l)	152.23	F ₂ (g)	202.67	Hg(l)	76.02
Ca(s)	41.42	H ₂ (g)	130.57	N ₂ (g)	191.50
C(graphite)	5.740	I ₂ (s)	116.14	O ₂ (g)	205.03