



STANDARD THERMOCHEMICAL FUNCTIONS

Enthalpy of formation h_f , Gibbs function of formation g_f , and absolute entropy s , at the standard state of $T=298.15$ K and $p=100$ kPa. In alphabetical order by the chemical formula.

| Substance | Formula (state) | h_f kJ/mol | g_f kJ/mol | s J/(mol K) |
|---------------------------------|---|-----------------|-----------------|------------------|
| Aluminium | Al(s) | 0 | 0 | 28 |
| Aluminium hydroxide | Al(OH) ₃ (s) | -1280 | -1146 | 85 |
| Aluminium oxide | Al ₂ O ₃ (s) | -1680 | -1580 | 51 |
| Carbon (graphite) | C(s) | 0 | 0 | 5.74 |
| Carbon (diamond) | C(s) | 1.90 | 2.89 | 2.38 |
| Methane | CH ₄ (g) | -74.85 | -50.79 | 186.16 |
| Methanol (ideal vapour state) | CH ₄ O(g) | -200.7 | -162 | 239.7 |
| Methanol | CH ₄ O(l) | -238.81 | -166.29 | 126.8 |
| Acetylene | C ₂ H ₂ (g) | 226.73 | 209.17 | 200.8 |
| Ethylene | C ₂ H ₄ (g) | 52.28 | 68.12 | 219.8 |
| Ethane | C ₂ H ₆ (g) | -84.68 | -32.89 | 229.5 |
| Ethanol (ideal vapour state) | C ₂ H ₆ O(g) | -238.4 | -169 | 272 |
| Ethanol | C ₂ H ₆ O(l) | -277.7 | -174.9 | 160.7 |
| DME (dimethyl ether) | C ₂ H ₆ O(g) | -184.10 | -112.60 | 266.4 |
| Propylene (propene) | C ₃ H ₆ (g) | 20.41 | 62.72 | 267 |
| n-Propane | C ₃ H ₈ (g) | -103.85 | -25 | 270 |
| n-Propane (ideal liquid state)* | C ₃ H ₈ (l) | -121.2 | -18 | 194 |
| n-Butane | C ₄ H ₁₀ (g) | -126.15 | -17.9 | 310.0 |
| n-Butane (ideal liquid state)* | C ₄ H ₁₀ (l) | -146 | -18 | 240 |
| Isobutane (2-methylpropane) | C ₄ H ₁₀ (g) | -134 | -20 | 295 |
| Isobutane (ideal liquid state)* | C ₄ H ₁₀ (l) | -154 | -18.5 | 225 |
| Ether (DEE ideal vapour state) | C ₄ H ₁₀ O(g) | -252.7 | -137 | 342 |
| Ether (DEE, diethyl ether) | C ₄ H ₁₀ O(l) | -271.2 | -145 | 253 |
| n-Pentane (ideal vapour state) | C ₅ H ₁₂ (g) | -146.44 | -8 | 348.4 |
| n-Pentane | C ₅ H ₁₂ (l) | -173 | -9 | 263 |
| Benzene (ideal vapour state) | C ₆ H ₆ (g) | 82.6 | 130 | 269.3 |
| Benzene | C ₆ H ₆ (l) | 49.10 | 120 | 173.3 |
| Glucose | C ₆ H ₁₂ O ₆ (s) | -1268 | -910 | 212 |
| n-Hexane (ideal vapour state) | C ₆ H ₁₄ (g) | -167 | 0.4 | 387 |
| n-Hexane | C ₆ H ₁₄ (l) | -198.8 | -4 | 296 |
| n-Heptane (ideal vapour state) | C ₇ H ₁₆ (g) | -180 | 16 | 428 |
| n-Heptane | C ₇ H ₁₆ (l) | -225 | 1 | 328 |
| n-Octane (ideal vapour state) | C ₈ H ₁₈ (g) | -208 | 17 | 464 |
| n-Octane | C ₈ H ₁₈ (l) | -250 | 6 | 361 |
| iso-Octane (ideal vapour state) | C ₈ H ₁₈ (g) | -224 | 12.3 | 428 |
| iso-Octane | C ₈ H ₁₈ (l) | -260 | 5.8 | 329 |
| Naphthalene | C ₁₀ H ₈ (s) | 76 | 199 | 167 |

| | | | | |
|---|---|---------|---------|--------|
| n-Decane | C ₁₀ H ₂₂ (l) | -250 | 34.4 | 540 |
| Sucrose | C ₁₂ H ₂₂ O ₁₁ (s) | -2222 | -1545 | 360 |
| n-Dodecene-1 (ideal vapour state) | C ₁₂ H ₂₄ (g) | -165 | 147 | 589 |
| n-Dodecene-1 | C ₁₂ H ₂₄ (l) | -226 | 117 | 485 |
| n-Dodecane (ideal vapour state) | C ₁₂ H ₂₆ (g) | -291 | 50.2 | 623 |
| n-Dodecane | C ₁₂ H ₂₆ (l) | -351 | 28 | 493 |
| n-Hexadecane (cetane) | C ₁₆ H ₃₄ (l) | -456 | 58.5 | 586 |
| Carbon monoxide | CO(g) | -110.53 | -137.15 | 197.6 |
| Carbon dioxide | CO ₂ (g) | -393.52 | -394.38 | 213.67 |
| Urea | CO(NH ₂) ₂ (s) | -333.5 | -197.3 | 104.6 |
| Iron | Fe(s) | 0 | 0 | 27 |
| Iron (II) oxide | FeO(s) | -267 | -257 | 59 |
| Iron (III) oxide | Fe ₂ O ₃ (s) | -822 | -791 | 90 |
| Iron (II)-(III) oxide | Fe ₃ O ₄ (s) | -1120 | -1015 | 146 |
| Hydrogen atomic | H(g) | 218.00 | 203.29 | 114.61 |
| Hydrogen | H ₂ (g) | 0 | 0 | 130.57 |
| Nitric acid (ideal vapour state) | HNO ₃ (g) | -134 | -74 | 267 |
| Nitric acid | HNO ₃ (l) | -174 | -81 | 156 |
| Water (ideal vapour state) | H ₂ O(g) | -241.82 | -228.59 | 188.72 |
| Water | H ₂ O(l) | -285.83 | -237.18 | 69.95 |
| Hydrogen peroxide (ideal vapour state) | H ₂ O ₂ (g) | -136.31 | -105.60 | 232.63 |
| Hydrogen peroxide | H ₂ O ₂ (l) | -188 | -120 | 110 |
| Nitrogen atomic | N(g) | 472.68 | 455.51 | 153.19 |
| Nitrogen | N ₂ (g) | 0 | 0 | 191.50 |
| Nitrogen monoxide | NO(g) | 90.25 | 86.57 | 210.65 |
| Nitrogen dioxide | NO ₂ (g) | 33.18 | 51.30 | 239.95 |
| di-Nitrogen oxide | N ₂ O(g) | 82.1 | 104.2 | 220 |
| di-Nitrogen oxide (ideal liquid state)* | N ₂ O(l) | 69.8 | 113 | 148.5 |
| di-Nitrogen tetroxide | N ₂ O ₄ (g) | 9.16 | 97.9 | 304.2 |
| di-Nitrogen tetroxide (ideal liquid state)* | N ₂ O ₄ (l) | -19.6 | 97.4 | 209.2 |
| Ammonia | NH ₃ (g) | -46.19 | -16.59 | 192.33 |
| Ammonia (ideal liquid state)* | NH ₃ (l) | -66.8 | -11.2 | 104.8 |
| Ammonium perchlorate (AP) | NH ₄ ClO ₄ (s) | -295 | -89 | 184 |
| Hydrazine (ideal vapour state) | N ₂ H ₄ (g) | 95.4 | 159 | 238 |
| Hydrazine | N ₂ H ₄ (l) | 50.63 | 149.3 | 121.21 |
| Monomethyl hydrazine (MMH) | N ₂ H ₃ CH ₃ (l) | 54.14 | 180 | 166 |
| Unsymmetrical dimethyl hydrazine (UDMH) | N ₂ H ₂ (CH ₃) ₂ (l) | 48.3 | 205 | 200 |
| Oxygen atomic | O(g) | 249.17 | 231.77 | 160.95 |
| Oxygen | O ₂ (g) | 0 | 0 | 205.04 |
| Ozone | O ₃ (g) | 142.4 | 162.9 | 238.80 |
| Hydroxyl | OH(g) | 39.46 | 34.28 | 183.75 |
| Sulfur (rhombic) | S(s) | 0 | 0 | 31.80 |
| Sulfur dioxide | SO ₂ (g) | -296.83 | -300.19 | 248.11 |
| Sulfur trioxide | SO ₃ (g) | -395.8 | -371.0 | 256.8 |

* Those substances are gases at 100 kPa and 25 °C, but often used as compressed liquids.

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