

Chemistry data sheet

Formula sheet

$$n = \frac{n}{MM}$$

$$c = \frac{n}{V}$$

$$PV = nRT$$

$$q = mC\Delta T$$

$$\Delta G^\circ = \Delta H^\circ - T\Delta S^\circ$$

$$pH = -\log_{10}[H^+]$$

$$pK_a = -\log_{10}[K_a]$$

$$A = \epsilon lc = -\log_{10} \frac{I_0}{I}$$

Avogadro constant, N_A $6.022 \times 10^{23} \text{ mol}^{-1}$

Volume of 1 mole ideal gas: at 100 kPa and
 at 0°C (273.15 K) 22.71 L
 at 25°C (298.15 K) 24.79 L

Ionisation constant for water at 25°C (298.15 K), K_w 1.0×10^{-14}

Specific heat capacity of water $4.18 \times 10^3 \text{ J kg}^{-1} \text{ K}^{-1}$


Solubility constants at 25°C

Compound	K_{sp}	Compound	K_{sp}
Barium carbonate	2.58×10^{-19}	Lead (II) bromide	6.60×10^{-6}
Barium hydroxide	2.55×10^{-4}	Lead (II) chloride	1.70×10^{-5}
Barium phosphate	1.3×10^{-29}	Lead (II) iodide	9.8×10^{-9}
Barium sulfate	1.08×10^{-10}	Lead (II) carbonate	7.4×10^{-14}
Calcium carbonate	3.36×10^{-9}	Lead (II) hydroxide	1.43×10^{-15}
Calcium hydroxide	5.02×10^{-6}	Lead (II) phosphate	8.0×10^{-43}
Calcium phosphate	2.07×10^{-29}	Lead (II) sulfate	2.53×10^{-8}
Calcium sulfate	4.93×10^{-5}	Magnesium carbonate	6.82×10^{-6}
Copper (II) carbonate	1.4×10^{-10}	Magnesium hydroxide	5.61×10^{-12}
Copper (II) hydroxide	2.2×10^{-20}	Magnesium phosphate	1.04×10^{-24}
Copper (II) phosphate	1.4×10^{-37}	Silver bromide	5.35×10^{-13}
Iron (II) carbonate	3.13×10^{-11}	Silver chloride	1.77×10^{-10}
Iron (II) hydroxide	4.87×10^{-17}	Silver carbonate	8.46×10^{-12}
Iron (III) phosphate	2.79×10^{-39}	Silver hydroxide	2.0×10^{-8}
Iron (III) sulfate	9.91×10^{-16}	Silver iodide	8.52×10^{-17}
		Silver phosphate	8.89×10^{-17}
		Silver sulfate	1.20×10^{-5}

Infrared absorption data

Bond	Wavenumber/cm ⁻¹
N - H (amines)	3300 - 3500
O - H (alcohols)	3230 - 3550 (broad)
C - H	2850 - 3300
O - H (acids)	2500 - 3000 (very broad)
C ≡ N	2220 - 2260
C = O	1680 - 1750
C = C	1620 - 1680
C - O	1000 - 1300
C - C	750 - 1100

¹³C NMR chemical shift data

Type of carbon	δ / ppm
$\begin{array}{c} \quad \\ -C - C- \\ \quad \end{array}$	5 - 40
$R - \begin{array}{c} \\ C - Cl \text{ or Br} \\ \end{array}$	10 - 70
$R - \begin{array}{c} \\ C - C \\ \quad \\ O \quad I \end{array}$	20 - 50
$R - C - N \begin{array}{l} / \\ \backslash \end{array}$	25 - 60
$\begin{array}{c} \\ -C - O - \\ \end{array}$ alcohols, ethers or esters	50 - 90
$\begin{array}{c} \diagdown \quad \diagup \\ C = C \\ \diagup \quad \diagdown \end{array}$	90 - 150
$R - C \equiv N$	110 - 125
	110 - 160
$R - \begin{array}{c} C - \\ \\ O \end{array}$ esters or acids	160 - 185
$R - \begin{array}{c} C - \\ \\ O \end{array}$ aldehydes or ketones	190 - 220

UV absorption

(This is not a definite list and is approximate)

Chromophore	λ _{max} (nm)
C - H	122
C - C	135
C = C	162

Chromophore	λ _{max} (nm)
C ≡ H	173 178 196 222
C - Cl	173
C - Br	208

Some standard potentials

$K^+ + e^-$	\rightleftharpoons	$K_{(s)}$	-2.94 V
$Ba^{2+} + 2e^-$	\rightleftharpoons	$Ba_{(s)}$	-2.91 V
$Ca^{2+} + 2e^-$	\rightleftharpoons	$Ca_{(s)}$	-2.87 V
$Na^+ + e^-$	\rightleftharpoons	$Na_{(s)}$	-2.71 V
$Mg^{2+} + 2e^-$	\rightleftharpoons	$Mg_{(s)}$	-2.36 V
$Al^{3+} + 3e^-$	\rightleftharpoons	$Al_{(s)}$	-1.68 V
$Mn^{2+} + 2e^-$	\rightleftharpoons	$Mn_{(s)}$	-1.18 V
$H_2O + e^-$	\rightleftharpoons	$\frac{1}{2}H_{2(g)} + OH^-$	-0.83 V
$Zn^{2+} + 2e^-$	\rightleftharpoons	$Zn_{(s)}$	-0.76 V
$Fe^{2+} + 2e^-$	\rightleftharpoons	$Fe_{(s)}$	-0.44 V
$Ni^{2+} + 2e^-$	\rightleftharpoons	$Ni_{(s)}$	-0.24 V
$Sn^{2+} + 2e^-$	\rightleftharpoons	$Sn_{(s)}$	-0.14 V
$Pb^{2+} + 2e^-$	\rightleftharpoons	$Pb_{(s)}$	-0.13 V
$H^+ + e^-$	\rightleftharpoons	$\frac{1}{2}H_{2(g)}$	0.00 V
$SO_4^{2-} + 4H^+ + 2e^-$	\rightleftharpoons	$SO_{2(aq)} + 2H_2O$	0.16 V
$Cu^{2+} + 2e^-$	\rightleftharpoons	$Cu_{(s)}$	0.34 V
$\frac{1}{2}O_{2(g)} + H_2O + 2e^-$	\rightleftharpoons	$2OH^-$	0.40 V
$Cu^+ + e^-$	\rightleftharpoons	$Cu_{(s)}$	0.52 V
$\frac{1}{2}I_{2(s)} + e^-$	\rightleftharpoons	I^-	0.54 V
$\frac{1}{2}I_{2(aq)} + e^-$	\rightleftharpoons	I^-	0.62 V
$Fe^{3+} + e^-$	\rightleftharpoons	Fe^{2+}	0.77 V
$Ag^+ + e^-$	\rightleftharpoons	$Ag_{(s)}$	0.80 V
$\frac{1}{2}Br_{2(l)} + e^-$	\rightleftharpoons	Br^-	1.08 V
$\frac{1}{2}Br_{2(aq)} + e^-$	\rightleftharpoons	Br^-	1.10 V
$\frac{1}{2}O_{2(g)} + 2H^+ + 2e^-$	\rightleftharpoons	H_2O	1.23 V
$\frac{1}{2}Cl_{2(g)} + e^-$	\rightleftharpoons	Cl^-	1.36 V
$\frac{1}{2}Cr_2O_7^{2-} + 7H^+ + 3e^-$	\rightleftharpoons	$Cr^{3+} + \frac{7}{2}H_2O$	1.36 V
$\frac{1}{2}Cl_{2(aq)} + e^-$	\rightleftharpoons	Cl^-	1.40 V
$MnO_4^- + 8H^+ + 5e^-$	\rightleftharpoons	$Mn^{2+} + 4H_2O$	1.51 V
$\frac{1}{2}F_{2(g)} + e^-$	\rightleftharpoons	F^-	2.89 V