Curriculum Council
Government of Western Australia

WACE
Western Australian Certificate of Education

CHEMISTRY DATA SHEET

Revised September 2007

FORMULA

Number of moles	n	=	$\frac{m}{M}$ (mass) / (molar mass)
Number of moles of solute	n	=	cV
Number of moles of a gas at STP	n	=	$\frac{V}{22.41}$
Ideal gas law	PV	=	nRT
Parts per million	ppm	=	$\frac{\text{mass of solute (mg)}}{\text{mass of solution (kg)}}$
pH of a solution	pH	=	$-\log [H^+]$

Solubility rules for ionic solids in water

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Soluble in water

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Soluble	**Exceptions**	
	Insoluble	**Slightly soluble**
Most chlorides	AgCl,	$PbCl_2$
Most bromides	AgBr,	$PbBr_2$
Most iodides	AgI, PbI_2	
All nitrates	No exceptions	
All ethanoates		
Most sulfates	$SrSO_4$, $BaSO_4$, $HgSO_4$, $PbSO_4$	$CaSO_4$, Ag_2SO_4

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Insoluble in water

Insoluble	**Exceptions**	
	Soluble	**Slightly soluble**
Most hydroxides	NaOH, KOH, $Ba(OH)_2$ (NH_4OH and AgOH do not exist)	$Ca(OH)_2$, $Sr(OH)_2$
Most carbonates	Na_2CO_3, K_2CO_3, $(NH_4)_2CO_3$	
Most phosphates	Na_3PO_4, K_3PO_4, $(NH_4)_3PO_4$	
Most sulfides	Na_2S, K_2S, $(NH_4)_2S$	

Soluble	=	more than 0.1 mole dissolves per litre
Slightly soluble	=	between 0.01 and 0.1 mole dissolves per litre
Insoluble	=	less than 0.01 mole dissolves per litre

Colour of species in aqueous solution

Cation	Colour	Cation	Colour	Anion	Colour	Halogen	Colour
Al^{3+}	colourless	Mn^{2+}	very pale pink	Br^-	colourless	$C\ell_{2(aq)}$	pale yellow
NH_4^+	colourless	Ni^{2+}	green	$C\ell^-$	colourless	$Br_{2\ (aq)}$	orange
Ba^{2+}	colourless	Ag^+	colourless	CrO_4^{2-}	yellow	$I_{2(aq)}$	brown
Ca^{2+}	colourless	Na^+	colourless	$Cr_2O_7^{2-}$	orange		
Cr^{3+}	deep green	Sr^{2+}	colourless	I^-	colourless	**Halogen in organic solvent**	
Co^{2+}	pink	Sn^{2+}	colourless	MnO_4^-	deep purple	**Halogen**	**Colour**
Cu^{2+}	blue	Zn^{2+}	colourless	PO_4^{3-}	colourless	Br_2	red
Fe^{2+}	pale green			S^{2-}	colourless	I_2	purple
Fe^{3+}	brown						
K^+	colourless						
Pb^{2+}	colourless						
Mg^{2+}	colourless			-			

Standard Reduction Potentials at 25°C

Half-reaction	E°(volts)
$F_2(g) + 2\ e^- \rightleftharpoons 2\ F^-(aq)$	+ 2.87
$H_2O_2(aq) + 2\ H^+(aq) + 2\ e^- \rightleftharpoons 2\ H_2O(\ell)$	+ 1.78
$PbO_2(s) + SO_4^{2-}(aq) + 4\ H^+(aq) + 2\ e^- \rightleftharpoons PbSO_4(s) + 2\ H_2O(\ell)$	+ 1.69
$2\ HC\ell O(aq) + 2\ H^+(aq) + 2\ e^- \rightleftharpoons C\ell_2(g) + 2\ H_2O(\ell)$	+ 1.61
$MnO_4^-(aq) + 8\ H^+(aq) + 5\ e^- \rightleftharpoons Mn^{2+}(aq) + 4\ H_2O(\ell)$	+ 1.51
$Au^{3+}(aq) + 3\ e^- \rightleftharpoons Au(s)$	+ 1.50
$HC\ell O(aq) + H^+(aq) + 2\ e^- \rightleftharpoons C\ell^-(aq) + H_2O(\ell)$	+ 1.48
$PbO_2(s) + 4\ H^+(aq) + 2\ e^- \rightleftharpoons Pb^{2+}(aq) + 2\ H_2O(\ell)$	+ 1.46
$Cl_2(g) + 2\ e^- \rightleftharpoons 2\ C\ell^-(aq)$	+ 1.36
$Cr_2O_7^{2-}(aq) + 14\ H^+(aq) + 6\ e^- \rightleftharpoons 2\ Cr^{3+}(aq) + 7\ H_2O(\ell)$	+ 1.23
$O_2(g) + 4\ H^+(aq) + 4\ e^- \rightleftharpoons 2\ H_2O(\ell)$	+ 1.23
$Br_2(\ell) + 2\ e^- \rightleftharpoons 2\ Br^-(aq)$	+ 1.07
$NO_3^-(aq) + 4\ H^+(aq) + 3\ e^- \rightleftharpoons NO(g) + 2\ H_2O(\ell)$	+ 0.96
$2\ Hg^{2+}(aq) + 2\ e^- \rightleftharpoons Hg_2^{2+}(aq)$	+ 0.91
$Ag^+(aq) + e^- \rightleftharpoons Ag(s)$	+ 0.80
$Fe^{3+}(aq) + e^- \rightleftharpoons Fe^{2+}(aq)$	+ 0.77
$O_2(g) + 2\ H^+(aq) + 2\ e^- \rightleftharpoons H_2O_2(aq)$	+ 0.68
$I_2(s) + 2\ e^- \rightleftharpoons 2\ I^-(aq)$	+ 0.54
$O_2(g) + 2\ H_2O(\ell) + 4\ e^- \rightleftharpoons 4\ OH^-(aq)$	+ 0.40
$Cu^{2+}(aq) + 2\ e^- \rightleftharpoons Cu(s)$	+ 0.34
$2\ H^+(aq) + 2\ e^- \rightleftharpoons H_2(g)$	0 exactly
$Pb^{2+}(aq) + 2\ e^- \rightleftharpoons Pb(s)$	– 0.13
$Sn^{2+}(aq) + 2\ e^- \rightleftharpoons Sn(s)$	– 0.14
$Ni^{2+}(aq) + 2\ e^- \rightleftharpoons Ni(s)$	– 0.26
$Co^{2+}(aq) + 2\ e^- \rightleftharpoons Co(s)$	– 0.28
$PbSO_4(s) + 2\ e^- \rightleftharpoons Pb(s) + SO_4^{2-}(aq)$	– 0.36
$Cd^{2+}(aq) + 2\ e^- \rightleftharpoons Cd(s)$	– 0.40
$2\ CO_2(g) + 2\ H^+(aq) + 2\ e^- \rightleftharpoons HOOCCOOH(aq)$	– 0.43
$Fe^{2+}(aq) + 2\ e^- \rightleftharpoons Fe(s)$	– 0.44
$Cr^{3+}(aq) + 3\ e^- \rightleftharpoons Cr(s)$	– 0.73
$Zn^{2+}(aq) + 2\ e^- \rightleftharpoons Zn(s)$	– 0.76
$2\ H_2O(\ell) + 2\ e^- \rightleftharpoons H_2(g) + 2\ OH^-(aq)$	– 0.83
$Mn^{2+}(aq) + 2\ e^- \rightleftharpoons Mn(s)$	– 1.18
$A\ell^{3+}(aq) + 3\ e^- \rightleftharpoons A\ell(s)$	– 1.66
$Mg^{2+}(aq) + 2\ e^- \rightleftharpoons Mg(s)$	– 2.37
$Na^+(aq) + e^- \rightleftharpoons Na(s)$	– 2.71
$Ca^{2+}(aq) + 2\ e^- \rightleftharpoons Ca(s)$	– 2.76
$Sr^{2+}(aq) + 2\ e^- \rightleftharpoons Sr(s)$	– 2.89
$Ba^{2+}(aq) + 2\ e^- \rightleftharpoons Ba(s)$	– 2.91
$K^+(aq) + e^- \rightleftharpoons K(s)$	– 2.93

Periodic Table

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1 H 1.008																	2 He 4.003
3 Li 6.941	4 Be 9.012											5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18
11 Na 22.99	12 Mg 24.31											13 Aℓ 26.98	14 Si 28.09	15 P 30.97	16 S 32.06	17 Cℓ 35.45	18 Ar 39.95
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.88	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.38	31 Ga 69.72	32 Ge 72.59	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80
37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc	44 Ru 101.1	45 Rh 102.9	46 Pd 106.4	47 Ag 107.9	48 Cd 112.4	49 In 114.8	50 Sn 118.7	51 Sb 121.8	52 Te 127.6	53 I 126.9	54 Xe 131.3
55 Cs 132.9	56 Ba 137.3	57 *La 138.9	72 Hf 178.5	73 Ta 180.9	74 W 183.9	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.1	79 Au 197.0	80 Hg 200.6	81 Tl 204.4	82 Pb 207.2	83 Bi 209.0	84 Po	85 At	86 Rn
87 Fr	88 Ra 226.0	89 **Ac	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt									

* Lanthanide Series	58 Ce 140.1	59 Pr 140.9	60 Nd 144.2	61 Pm	62 Sm 150.4	63 Eu 152.0	64 Gd 157.3	65 Tb 158.9	66 Dy 162.5	67 Ho 164.9	68 Er 167.3	69 Tm 168.9	70 Yb 173.0	71 Lu 175.0
** Actinide Series	90 Th 232.0	91 Pa	92 U 238.0	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr

6 ← Atomic Number
C ← Symbol
12.01 ← Atomic Mass