

## EXAMINATION DATA SHEET FOR THE PHYSICAL SCIENCES (CHEMISTRY)

**TABLE 1      PHYSICAL CONSTANTS**

NAME	SYMBOL	VALUE
Magnitude of charge on electron	e	$1,6 \times 10^{-19} \text{ C}$
Mass of an electron	$m_e$	$9,1 \times 10^{-31} \text{ kg}$
Standard pressure	$p^\theta$	$1,01 \times 10^5 \text{ Pa}$
Molar gas volume at STP	$V_m$	$22,4 \text{ dm}^3 \cdot \text{mol}^{-1}$
Standard temperature	$T^\theta$	273 K
Avogadro's constant	$N_A$	$6,02 \times 10^{23} \text{ mol}^{-1}$
Faraday's constant	F	$96\,500 \text{ C} \cdot \text{mol}^{-1}$

**TABLE 2      CHEMISTRY FORMULAE**

$n = \frac{m}{M}$	$n = \frac{N}{N_A}$	$n = \frac{V}{V_m}$
$c = \frac{n}{V}$ OR $c = \frac{m}{MV}$	$K_w = [H_3O^+][OH^-] = 1 \times 10^{-14} \text{ at } 298 \text{ K}$	
$Q = It$	$E_{\text{cell}}^\theta = E_{\text{cathode}}^\theta - E_{\text{anode}}^\theta$ $E_{\text{cell}}^\theta = E_{\text{oxidising agent}}^\theta - E_{\text{reducing agent}}^\theta$	

**TABLE 3 PERIODIC TABLE**

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18					
1	Atomic number (Z)						Electronegativity																
	1 2,1 <b>H</b> 1						1 2,1 <b>H</b> 1						2 <b>He</b> 4										
2	3 1,0 <b>Li</b> 7		4 1,5 <b>Be</b> 9														5 2,0 <b>B</b> 10,8		6 2,5 <b>C</b> 12	7 3,0 <b>N</b> 14	8 3,5 <b>O</b> 16	9 4,0 <b>F</b> 19	10 <b>Ne</b> 20
3	11 0,9 <b>Na</b> 23		12 1,2 <b>Mg</b> 24,3														13 1,5 <b>Al</b> 27		14 1,8 <b>Si</b> 28	15 2,1 <b>P</b> 31	16 2,5 <b>S</b> 32	17 3,0 <b>Cl</b> 35,5	18 <b>Ar</b> 40
4	19 0,8 <b>K</b> 39		20 1,0 <b>Ca</b> 40		21 1,3 <b>Sc</b> 45	22 1,5 <b>Ti</b> 48	23 1,6 <b>V</b> 51	24 1,6 <b>Cr</b> 52	25 1,5 <b>Mn</b> 55	26 1,8 <b>Fe</b> 56	27 1,8 <b>Co</b> 59	28 1,8 <b>Ni</b> 59	29 1,9 <b>Cu</b> 63,5	30 1,6 <b>Zn</b> 65,4	31 1,6 <b>Ga</b> 70	32 1,8 <b>Ge</b> 72,6	33 2,0 <b>As</b> 75	34 2,4 <b>Se</b> 79	35 2,8 <b>Br</b> 80	36 <b>Kr</b> 84			
5	37 0,8 <b>Rb</b> 85,5		38 1,0 <b>Sr</b> 88		39 1,2 <b>Y</b> 89	40 1,4 <b>Zr</b> 91	41 1,6 <b>Nb</b> 93	42 1,8 <b>Mo</b> 96	43 1,9 <b>Tc</b> 99	44 2,2 <b>Ru</b> 101	45 2,2 <b>Rh</b> 103	46 2,2 <b>Pd</b> 106	47 1,9 <b>Ag</b> 108	48 1,7 <b>Cd</b> 112	49 1,7 <b>In</b> 115	50 1,8 <b>Sn</b> 119	51 1,9 <b>Sb</b> 121	52 2,1 <b>Te</b> 128	53 2,5 <b>I</b> 127	54 <b>Xe</b> 131			
6	55 <b>Cs</b> 133		56 <b>Ba</b> 137,3			72 <b>Hf</b> 178,5	73 <b>Ta</b> 181	74 <b>W</b> 184	75 <b>Re</b> 186	76 <b>Os</b> 190	77 <b>Ir</b> 192	78 <b>Pt</b> 195	79 <b>Au</b> 197	80 <b>Hg</b> 200,6	81 <b>Tl</b> 204,4	82 <b>Pb</b> 207	83 <b>Bi</b> 209	84 <b>Po</b> –	85 <b>At</b> –	86 <b>Rn</b> –			
7	87 <b>Fr</b>		88 <b>Ra</b>																				
			57 <b>La</b>	58 <b>Ce</b>	59 <b>Pr</b>	60 <b>Nd</b>	61 <b>Pm</b>	62 <b>Sm</b>	63 <b>Eu</b>	64 <b>Gd</b>	65 <b>Tb</b>	66 <b>Dy</b>	67 <b>Ho</b>	68 <b>Er</b>	69 <b>Tm</b>	70 <b>Yb</b>	71 <b>Lu</b>						
			89 <b>Ac</b>	90 <b>Th</b>	91 <b>Pa</b>	92 <b>U</b>	93 <b>Np</b>	94 <b>Pu</b>	95 <b>Am</b>	96 <b>Cm</b>	97 <b>Bk</b>	98 <b>Cf</b>	99 <b>Es</b>	100 <b>Fm</b>	101 <b>Md</b>	102 <b>No</b>	103 <b>Lw</b>						

**TABLE 4      STANDARD ELECTRODE POTENTIALS**

	Half –reaction	E°/volt
	$\text{Li}^+ + \text{e}^- \rightleftharpoons \text{Li}$	-3,05
	$\text{K}^+ + \text{e}^- \rightleftharpoons \text{K}$	-2,93
	$\text{Cs}^+ + \text{e}^- \rightleftharpoons \text{Cs}$	-2,92
	$\text{Ba}^{2+} + 2\text{e}^- \rightleftharpoons \text{Ba}$	-2,90
	$\text{Sr}^{2+} + 2\text{e}^- \rightleftharpoons \text{Sr}$	-2,89
	$\text{Ca}^{2+} + 2\text{e}^- \rightleftharpoons \text{Ca}$	-2,87
	$\text{Na}^+ + \text{e}^- \rightleftharpoons \text{Na}$	-2,71
	$\text{Mg}^{2+} + 2\text{e}^- \rightleftharpoons \text{Mg}$	-2,37
	$\text{Al}^{3+} + 3\text{e}^- \rightleftharpoons \text{Al}$	-1,66
	$\text{Mn}^{2+} + 2\text{e}^- \rightleftharpoons \text{Mn}$	-1,18
	$2\text{H}_2\text{O} + 2\text{e}^- \rightleftharpoons \text{H}_2(\text{g}) + 2\text{OH}^-$	-0,83
	$\text{Zn}^{2+} + 2\text{e}^- \rightleftharpoons \text{Zn}$	-0,76
	$\text{Cr}^{3+} + 3\text{e}^- \rightleftharpoons \text{Cr}$	-0,74
	$\text{Fe}^{2+} + 2\text{e}^- \rightleftharpoons \text{Fe}$	-0,44
	$\text{Cd}^{2+} + 2\text{e}^- \rightleftharpoons \text{Cd}$	-0,40
	$\text{Co}^{2+} + 2\text{e}^- \rightleftharpoons \text{Co}$	-0,28
	$\text{Ni}^{2+} + 2\text{e}^- \rightleftharpoons \text{Ni}$	-0,25
	$\text{Sn}^{2+} + 2\text{e}^- \rightleftharpoons \text{Sn}$	-0,14
	$\text{Pb}^{2+} + 2\text{e}^- \rightleftharpoons \text{Pb}$	-0,13
	$\text{Fe}^{3+} + 3\text{e}^- \rightleftharpoons \text{Fe}$	-0,04
	$2\text{H}^+ + 2\text{e}^- \rightleftharpoons \text{H}_2(\text{g})$	0,00
	$\text{S} + 2\text{H}^+ + 2\text{e}^- \rightleftharpoons \text{H}_2\text{S}(\text{g})$	+0,14
	$\text{Sn}^{4+} + 2\text{e}^- \rightleftharpoons \text{Sn}^{2+}$	+0,15
	$\text{SO}_4^{2-} + 4\text{H}^+ + 2\text{e}^- \rightleftharpoons \text{SO}_2(\text{g}) + 2\text{H}_2\text{O}$	+0,17
	$\text{Cu}^{2+} + 2\text{e}^- \rightleftharpoons \text{Cu}$	+0,34
	$2\text{H}_2\text{O} + \text{O}_2 + 4\text{e}^- \rightleftharpoons 4\text{OH}^-$	+0,40
	$\text{SO}_2 + 4\text{H}^+ + 4\text{e}^- \rightleftharpoons \text{S} + 2\text{H}_2\text{O}$	+0,45
	$\text{I}_2 + 2\text{e}^- \rightleftharpoons 2\text{I}^-$	+0,54
	$\text{O}_2(\text{g}) + 2\text{H}^+ + 2\text{e}^- \rightleftharpoons \text{H}_2\text{O}_2$	+0,68
	$\text{Fe}^{3+} + \text{e}^- \rightleftharpoons \text{Fe}^{2+}$	+0,77
	$\text{Hg}^{2+} + 2\text{e}^- \rightleftharpoons \text{Hg}$	+0,79
	$\text{NO}_3^- + 2\text{H}^+ + \text{e}^- \rightleftharpoons \text{NO}_2(\text{g}) + \text{H}_2\text{O}$	+0,80
	$\text{Ag}^+ + \text{e}^- \rightleftharpoons \text{Ag}$	+0,80
	$\text{NO}_3^- + 4\text{H}^+ + 3\text{e}^- \rightleftharpoons \text{NO}(\text{g}) + 2\text{H}_2\text{O}$	+0,96
	$\text{Br}_2 + 2\text{e}^- \rightleftharpoons 2\text{Br}^-$	+1,09
	$\text{Pt}^{2+} + 2\text{e}^- \rightleftharpoons \text{Pt}$	+1,20
	$\text{MnO}_2 + 4\text{H}^+ + 2\text{e}^- \rightleftharpoons \text{Mn}^{2+} + 2\text{H}_2\text{O}$	+1,21
	$\text{O}_2 + 4\text{H}^+ + 4\text{e}^- \rightleftharpoons 2\text{H}_2\text{O}$	+1,23
	$\text{Cr}_2\text{O}_7^{2-} + 14\text{H}^+ + 6\text{e}^- \rightleftharpoons 2\text{Cr}^{3+} + 7\text{H}_2\text{O}$	+1,33
	$\text{Cl}_2(\text{g}) + 2\text{e}^- \rightleftharpoons 2\text{Cl}^-$	+1,36
	$\text{Au}^{3+} + 3\text{e}^- \rightleftharpoons \text{Au}$	+1,42
	$\text{MnO}_4^- + 8\text{H}^+ + 5\text{e}^- \rightleftharpoons \text{Mn}^{2+} + 4\text{H}_2\text{O}$	+1,51
	$\text{H}_2\text{O}_2 + 2\text{H}^+ + 2\text{e}^- \rightleftharpoons 2\text{H}_2\text{O}$	+1,77
	$\text{F}_2(\text{g}) + 2\text{e}^- \rightleftharpoons 2\text{F}^-$	+2,87

Increasing oxidising ability

Increasing reducing ability