

## 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 $c = \frac{m}{MV}$	$K_w = [H_3O^+] \cdot [OH^-] = 1 \times 10^{-14}$ at 25 °C (298 K)	
$q = It$ $q = nF$	$E_{\text{cell}}^\theta = E_{\text{cathode}}^\theta - E_{\text{anode}}^\theta$ $E_{\text{cell}}^\theta = E_{\text{oxidising agent}}^\theta - E_{\text{reducing agent}}^\theta$	

**TABLE 3 PERIODIC TABLE**

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
<b>1</b>	1 2,1 <b>H</b> 1	<div>Atomic number (Z)</div> <div>Electro-negativity</div> <div>Relative atomic mass</div>																2 4 <b>He</b>
<b>2</b>	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
<b>3</b>	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
<b>4</b>	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
<b>5</b>	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
<b>6</b>	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> –
<b>7</b>	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

↑