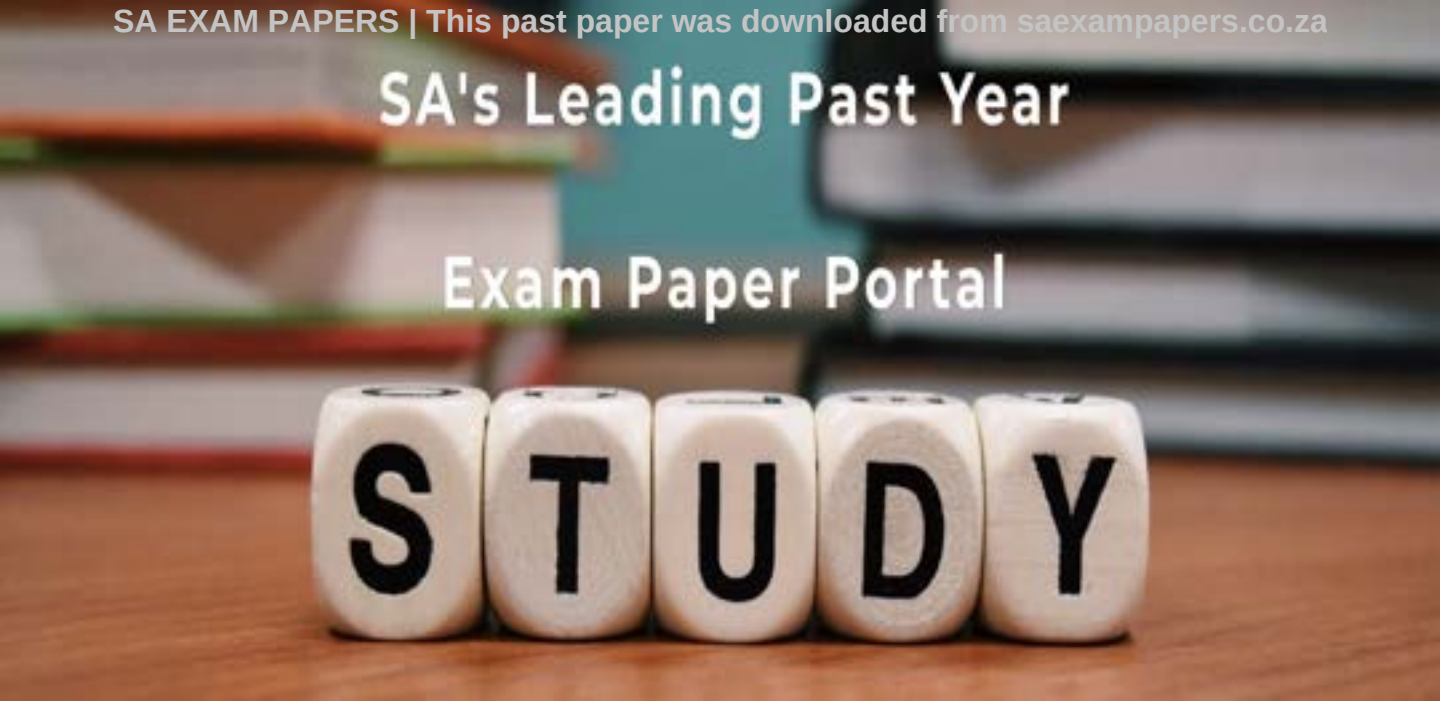


Province of the
EASTERN CAPE
EDUCATION

NATIONAL SENIOR CERTIFICATE

GRADE 12

JUNE 2024

TECHNICAL SCIENCES: CHEMISTRY P2

MARKS: **75**

TIME: **1½ hours**

This question paper consists of 15 pages, including 4 data sheets.

INSTRUCTIONS AND INFORMATION

1. Write your FULL NAME and SURNAME in the appropriate spaces in the ANSWER BOOK.
2. This question paper consists of SIX questions. Answer ALL the questions.
3. Start each question on a NEW page in the ANSWER BOOK.
4. Number the answers correctly according to the numbering system used in this question paper.
5. Leave ONE line between two sub-questions, for example between QUESTION 2.1 and QUESTION 2.2.
6. You may use a non-programmable calculator.
7. You are advised to use the attached DATA SHEETS.
8. Round off your FINAL numerical answers to a minimum of TWO decimal places.
9. You may use appropriate mathematical instruments.
10. Show ALL formulae and substitutions in ALL calculations.
11. Give brief motivations, discussions et cetera where required.
12. Write neatly and legibly.

QUESTION 1: MULTIPLE-CHOICE QUESTIONS

Various options are provided as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question numbers (1.1 to 1.5) in the ANSWER BOOK, for example 1.6 E.

1.1 The process of adding impurities to intrinsic semiconductors is called a(n) ...

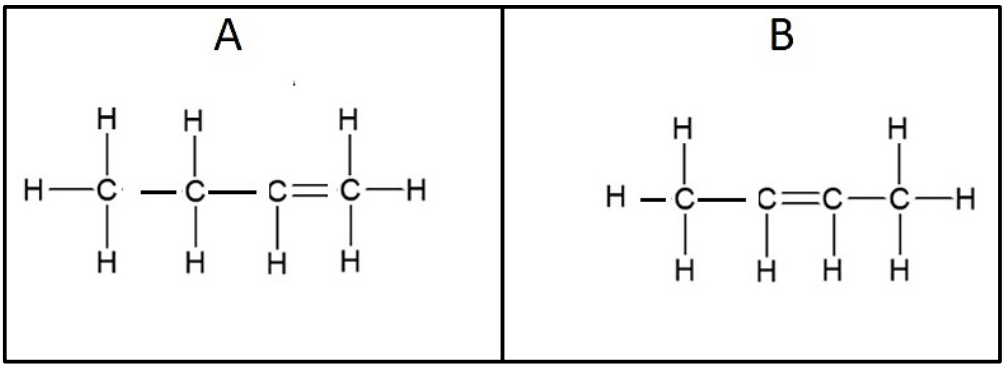
A intrinsic semiconductor.

B pure semiconductor.

C doping.

D purification. (2)

1.2 Consider the following structural formulae for compounds **A** and **B**.



These compounds have the same … and differ with …

A molecular formulae; positional isomers.

B molecular formulae; position of the functional group.

C molecules; positions.

D position of the functional group; structural formulae. (2)

1.3 Study the organic reaction below and answer the following question.

$$CH_4 + \mathbf{Y} \longrightarrow CO_2 + H_2O$$

Which ONE of the following does **Y** represent, and which is the correct reaction condition for products to form?

A H_20 and excess water

B O_2 and mild heat

C H_2 and heat

D O_2 and excess oxygen (2)

1.4 Which of the following sets is the correct for an N-type semiconductor?

	1	2	3
A	donor level	The extra electron is free to move	Not negatively charged
B	acceptor band	Electrons in the valence band move from hole to hole	The absence of an electron creates the effect of a positive charge
C	donor level	Electrons in the valence band move from hole to hole	Not negatively charged
D	acceptor band	The extra electron is free to move	The absence of an electron creates the effect of a positive charge

(2)

1.5 P-n junction

(i) In doping, a pure element is added to a semiconductor to improve the conductivity of the semiconductor.
(ii) In doping, a catalyst is added to a semiconductor to improve the conductivity of the semiconductor.
(iii) The n-region becomes positively charged because it has lost some electrons.
(iv) There is potential difference between the two sides of the diode.
(v) Electrons (few) gain enough thermal energy to cross the energy gap (from the valence band) to the conduction band.

Which ONE of the following combinations below is CORRECT for a p-n junction?

A (i) and (ii)

B (ii) and (iii)

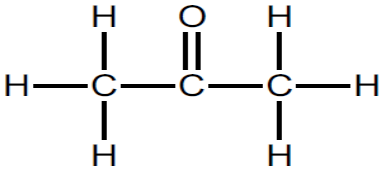
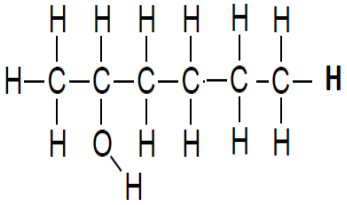
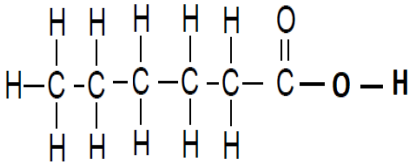
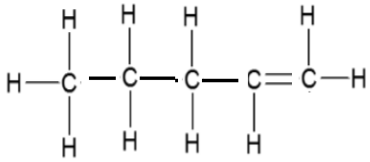
C (i) and (iv)

D (iii) and (iv) (2)

[10]

QUESTION 2 (Start on a new page.)

Consider the organic compounds represented by the letters **A** to **H** below and answer the questions that follow.

A	Hex-2-ene	**E**	2-methylpropan-2-ol
B		**F**	Ethylethanoate
C		**G**	
D		**H**	C_5H_{12}

2.1 Define the term *functional group*. (2)

2.2 Write down the letter(s) that represents the following:

2.2.1 A tertiary alcohol (1)

2.2.2 Unsaturated hydrocarbons (1)

2.2.3 An ester (1)

2.2.4 Hydrocarbons (1)

2.2.5 Positional isomers (1)

2.3 Write down the IUPAC name of the following:

2.3.1 **D** (1)

2.3.2 **B** (1)

2.3.3 **G** (1)

2.4 Write down the:

2.4.1 STRUCTURAL formula of compound **F** (2)

2.4.2 STRUCTURAL formula for the functional group of compound **C** (1)

2.4.3 MOLECULAR formula of compound **A** (1)

2.4.4 The name of the functional group of compound **B** (1)

2.4.5 STRUCTURAL formula of compound **E** (2)

[17]

QUESTION 3 (Start on a new page.)

Students were observing the vapour pressure of three (3) organic compounds from a homologous series with a general formula C_nH_{2n+2}, represented by **X**, **Y** and **Z**. The number of carbon atoms of these organic compounds ranges between 3 carbon atoms and 5 carbon atoms. Their results were graphed as follows:

COMPOUND	VAPOUR PRESSURE (kPa)	MOLECULAR MASS ($g.mol^{-1}$)
X	215	58
Y	202	73
Z	156	86

3.1 Define the term *vapour pressure.* (2)

3.2 Use the table above to draw a sketch graph of vapour pressure versus molecular mass. (3)

3.3 What hypothesis can be deduced from the graph? (1)

3.4 Give the industrial use of these organic compounds. (1)

3.5 Explain the difference in the vapour pressure of compound **Y** and **Z.** Refer to the MOLECULAR MASS, STRENGTH OF INTERMOLECULAR FORCES and THE ENERGY NEEDED. (3)

3.6 Which compound will have the …? (Write only **X**, **Y** or **Z**.)

3.6.1 highest viscosity (1)

3.6.2 lowest melting point (1)

3.6.3 highest boiling point (1)

[13]

QUESTION 4 (Start on a new page.)

The table below shows the boiling points of four organic compounds, represented by the letters **I** to **L**, of comparable molecular mass.

COMPOUND		FORMULA	BOILING POINT (°C)
A	**I**	CH_3OH	80
B	**J**	$CH_2C\ell_2$	40,1
C	**K**	$CHC\ell_3$	61,8
D	**L**	$CC\ell_4$	76,6

4.1 Define the term *boiling point.* (2)

4.2 In which homologous series does compound **K** in the table belong? (1)

4.3 Name the intermolecular forces in compound **J**. (1)

4.4 What trend can be observed from compound **J** to compound **L**, in the table? (1)

4.5 An investigation was conducted on the boiling points of compounds **I** and **L**.

4.5.1 Provide the IUPAC name of compound **L.** (1)

4.5.2 The comparison of **I** and **L** is a fair comparison. Give a reason why this is a true statement. (1)

4.5.3 Explain how the vapour pressure of compound **I** will compare to that of compound **L**. (2)

[9]

QUESTION 5 (Start on a new page.)

Alcohol **H** can be converted to many other compounds and be a product of other reactions. As such alcohol **H** was used to form an organic compound called **propyl butanoate**. Study the table below and answer the questions that follow.

REACTION NUMBER	ORGANIC REACTION
REACTION 1	Alkene + R $\longrightarrow$ Alcohol H
REACTION 2	Alkene + S $\longrightarrow$ Alkane W
REACTION 3	Alcohol H + Br_2 $\longrightarrow$ Haloalkane + V
REACTION 4	Haloalkane + R $\longrightarrow$ Alcohol H + T
REACTION 5	Alkane W + Y $\longrightarrow$ Z + H_2O

5.1 Are the intermolecular forces in **propyl butanoate** WEAKER or STRONGER than those in alcohol **H**? Write only WEAKER or STRONGER. (1)

5.2 Identify alcohol **H**. (1)

5.3 Write down the type of reaction represented by the following reactions:

5.3.1 Reaction **1** (1)

5.3.2 Reaction **3** (1)

5.3.3 Reaction **5** (1)

5.4 For Reaction **2**:

5.4.1 Write down the STRUCTURAL FORMULA for the alkene. (2)

5.4.2 Is compound **S**, ORGANIC or INORGANIC? (1)

5.4.3 Explain the answer to QUESTION 5.4.2 above. (1)

5.5 For Reaction **1,** write down:

5.5.1 The balanced chemical equation using STRUCTURAL FORMULAE (3)

5.5.2 One reaction condition (1)

5.6 For Reaction **5**, write down:

5.6.1 The STRUCTURAL FORMULA for alkane **W** (2)

5.6.2 NAME for compound **Y** (1)

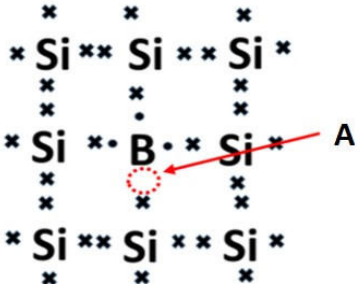
5.6.3 FORMULA for compound **Z** (1)
[17]

QUESTION 6 (Start on a new page.)

Study the diagram of a semiconductor below and answer questions that follow.

Note the following about semiconductors:

- Some semiconductors are formed by adding impurities to them and some formed at high temperatures where the atoms vibrate.
- Semiconductors are used in the manufacture of electronic devices such as diodes, transistors, and integrated circuits.



6.1 Which element represents a dopant in the diagram? Write only **Si** or **B**. (1)

6.2 How many valence electrons does this dopant have? (1)

6.3 What does **A** in the diagram above, represent? (1)

6.4 Define a *semiconductor.* (2)

6.5 Briefly explain what will happen if the semiconductor above is connected across the terminals of a cell. (2)

6.6 What is the purpose of doping? (1)

6.7 Identify the type of a semiconductor represented by the diagram above. (1)
[9]

TOTAL: 75

NATIONAL SENIOR CERTIFICATE
NASIONALE SENIOR SERTIFIKAAT

DATA FOR TECHNICAL SCIENCES GRADE 12
PAPER 2 (CHEMISTRY)

GEGEWENS VIR TEGNIESE WETENSKAPPE GRAAD 12
VRAESTEL 2 (CHEMIE)

TABLE 1: PHYSICAL CONSTANTS/*TABEL 1: FISIESE KONSTANTES*

NAAM/*NAME*	SIMBOOL/*SYMBOL*	WAARDE/*VALUE*
Avogadro se konstante Avogadro's constant	N_A	$6{,}02 \times 10^{23}\ mol^{-1}$
Molêre gaskonstante Molar gas constant	R	$8{,}31\ J{\cdot}K^{-1}{\cdot}mol^{-1}$
Standaarddruk Standard pressure	p^{θ}	$1{,}013 \times 10^{5}\ Pa$
Molêre gasvolume teen STD Molar gas volume at STP	V_m	$22{,}4\ dm^{3}{\cdot}mol^{-1}$
Standaardtemperatuur Standard temperature	T^{θ}	273 K

TABLE 2: FORMULAE/*TABEL 2: FORMULES*

$n = \frac{m}{M}$ or/*of* $n = \frac{N}{N_A}$ or/*of* $n = \frac{V}{V_m}$	$c = \frac{n}{V}$ or/*of* $c = \frac{m}{MV}$ $\frac{c_a V_a}{c_b V_b} = \frac{n_a}{n_b}$	pH= -log[H_3O^+] K_w = [H_3O^+][OH^-] = 1x10^{-14} at /by 298K
$E^{\theta}_{cell} = E^{\theta}_{cathode} - E^{\theta}_{anode}$ / $E^{\theta}_{sel} = E^{\theta}_{katode} - E^{\theta}_{anode}$ $E^{\theta}_{cell} = E^{\theta}_{reduction} - E^{\theta}_{oxidation}$ / $E^{\theta}_{sel} = E^{\theta}_{reduksie} - E^{\theta}_{oksidasie}$ $E^{\theta}_{cell} = E^{\theta}_{oxidising\ agent} - E^{\theta}_{reducing\ agent}$ / $E^{\theta}_{sel} = E^{\theta}_{oksideermiddel} - E^{\theta}_{reduseermiddel}$		

TABLE 3: THE PERIODIC TABLE OF ELEMENTS/*TABEL 3: DIE PERIODIEKE TABEL VAN ELEMENTE*

1 (I)	2 (II)	3	4	5	6	7	8	9	10	11	12	13 (III)	14 (IV)	15 (V)	16 (VI)	17 (VII)	18 (VIII)
2,1 1 H 1																	2 He 4
1,0 3 Li 7	1,5 4 Be 9											2.0 5 B 11	2.5 6 C 12	3.0 7 N 14	3.5 8 O 16	4.0 9 F 19	10 Ne 20
0,9 11 Na 23	1,2 12 Mg 24											1.5 13 Aℓ 27	1.8 14 Si 28	2.1 15 P 31	2.5 16 S 32	3,0 17 Cℓ 35,5	18 Ar 40
0,8 19 K 39	1,0 20 Ca 40	1,3 21 Sc 45	1,5 22 Ti 48	1.6 23 V 51	1,6 24 Cr 52	1.5 25 Mn 55	1.8 26 Fe 56	1.8 27 Co 59	1.8 28 Ni 59	1.9 29 Cu 63,5	1.6 30 Zn 65	1.6 31 Ga 70	1.8 32 Ge 73	2.0 33 As 75	2.4 34 Se 79	2.8 35 Br 80	36 Kr 84
0,8 37 Rb 86	1,0 38 Sr 88	1,2 39 Y 89	1,4 40 Zr 91	41 Nb 92	1,8 42 Mo 96	1.9 43 Tc	2.2 44 Ru 101	2.2 45 Rh 103	2.2 46 Pd 106	1.9 47 Ag 108	1.7 48 Cd 112	1.7 49 In 115	1.8 50 Sn 119	1.9 51 Sb 122	2.1 52 Te 128	2.5 53 I 127	54 Xe 131
0,7 55 Cs 133	0,9 56 Ba 137	57 La 139	1,6 72 Hf 179	73 Ta 181	74 W 184	75 Re 186	76 Os 190	77 Ir 192	78 Pt 195	79 Au 197	80 Hg 201	1.8 81 Tℓ 204	1.8 82 Pb 207	1.9 83 Bi 209	2.0 84 Po	2.5 85 At	86 Rn
0,7 87 Fr	0,9 88 Ra 226	89 Ac															

58 Ce 140	59 Pr 141	60 Nd 144	61 Pm	62 Sm 150	63 Eu 152	64 Gd 157	65 Tb 159	66 Dy 163	67 Ho 165	68 Er 167	69 Tm 169	70 Yb 173	71 Lu 175
90 Th 232	91 Pa	92 U 238	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr

KEY/ *SLEUTEL*

Atoomgetal Atomic number

Elektronegatiwiteit Electronegativity → 1,9 **Cu** 63,5 ← *Simbool* Symbol

Benaderde relatiewe atoommassa Approximate relative atomic mass

TABLE 4A: STANDARD REDUCTION POTENTIALS
TABEL 4A: STANDAARD REDUKSIEPOTENSIALE

Half-reactions/*Halfreaksies*			E^{θ} (V)
$F_2(g) + 2e^-$	$\rightleftharpoons$	$2F^-$	+ 2,87
$Co^{3+} + e^-$	$\rightleftharpoons$	Co^{2+}	+ 1,81
$H_2O_2 + 2H^+ + 2e^-$	$\rightleftharpoons$	$2H_2O$	+1,77
$MnO_4^- + 8H^+ + 5e^-$	$\rightleftharpoons$	$Mn^{2+} + 4H_2O$	+ 1,51
$C\ell_2(g) + 2e^-$	$\rightleftharpoons$	$2C\ell^-$	+ 1,36
$Cr_2O_7^{2-} + 14H^+ + 6e^-$	$\rightleftharpoons$	$2Cr^{3+} + 7H_2O$	+ 1,33
$O_2(g) + 4H^+ + 4e^-$	$\rightleftharpoons$	$2H_2O$	+ 1,23
$MnO_2 + 4H^+ + 2e^-$	$\rightleftharpoons$	$Mn^{2+} + 2H_2O$	+ 1,23
$Pt^{2+} + 2e^-$	$\rightleftharpoons$	Pt	+ 1,20
$Br_2(\ell) + 2e^-$	$\rightleftharpoons$	$2Br^-$	+ 1,07
$NO_3^- + 4H^+ + 3e^-$	$\rightleftharpoons$	$NO(g) + 2H_2O$	+ 0,96
$Hg^{2+} + 2e^-$	$\rightleftharpoons$	$Hg(\ell)$	+ 0,85
$Ag^+ + e^-$	$\rightleftharpoons$	Ag	+ 0,80
$NO_3^- + 2H^+ + e^-$	$\rightleftharpoons$	$NO_2(g) + H_2O$	+ 0,80
$Fe^{3+} + e^-$	$\rightleftharpoons$	Fe^{2+}	+ 0,77
$O_2(g) + 2H^+ + 2e^-$	$\rightleftharpoons$	H_2O_2	+ 0,68
$I_2 + 2e^-$	$\rightleftharpoons$	$2I^-$	+ 0,54
$Cu^+ + e^-$	$\rightleftharpoons$	Cu	+ 0,52
$SO_2 + 4H^+ + 4e^-$	$\rightleftharpoons$	$S + 2H_2O$	+ 0,45
$2H_2O + O_2 + 4e^-$	$\rightleftharpoons$	$4OH^-$	+ 0,40
$Cu^{2+} + 2e^-$	$\rightleftharpoons$	Cu	+ 0,34
$SO_4^{2-} + 4H^+ + 2e^-$	$\rightleftharpoons$	$SO_2(g) + 2H_2O$	+ 0,17
$Cu^{2+} + e^-$	$\rightleftharpoons$	Cu^+	+ 0,16
$Sn^{4+} + 2e^-$	$\rightleftharpoons$	Sn^{2+}	+ 0,15
$S + 2H^+ + 2e^-$	$\rightleftharpoons$	$H_2S(g)$	+ 0,14
$2H^+ + 2e^-$	**$\rightleftharpoons$**	**$H_2(g)$**	**0,00**
$Fe^{3+} + 3e^-$	$\rightleftharpoons$	Fe	– 0,06
$Pb^{2+} + 2e^-$	$\rightleftharpoons$	Pb	– 0,13
$Sn^{2+} + 2e^-$	$\rightleftharpoons$	Sn	– 0,14
$Ni^{2+} + 2e^-$	$\rightleftharpoons$	Ni	– 0,27
$Co^{2+} + 2e^-$	$\rightleftharpoons$	Co	– 0,28
$Cd^{2+} + 2e^-$	$\rightleftharpoons$	Cd	– 0,40
$Cr^{3+} + e^-$	$\rightleftharpoons$	Cr^{2+}	– 0,41
$Fe^{2+} + 2e^-$	$\rightleftharpoons$	Fe	– 0,44
$Cr^{3+} + 3e^-$	$\rightleftharpoons$	Cr	– 0,74
$Zn^{2+} + 2e^-$	$\rightleftharpoons$	Zn	– 0,76
$2H_2O + 2e^-$	$\rightleftharpoons$	$H_2(g) + 2OH^-$	– 0,83
$Cr^{2+} + 2e^-$	$\rightleftharpoons$	Cr	– 0,91
$Mn^{2+} + 2e^-$	$\rightleftharpoons$	Mn	– 1,18
$A\ell^{3+} + 3e^-$	$\rightleftharpoons$	$A\ell$	– 1,66
$Mg^{2+} + 2e^-$	$\rightleftharpoons$	Mg	– 2,36
$Na^+ + e^-$	$\rightleftharpoons$	Na	– 2,71
$Ca^{2+} + 2e^-$	$\rightleftharpoons$	Ca	– 2,87
$Sr^{2+} + 2e^-$	$\rightleftharpoons$	Sr	– 2,89
$Ba^{2+} + 2e^-$	$\rightleftharpoons$	Ba	– 2,90
$Cs^+ + e^-$	$\rightleftharpoons$	Cs	- 2,92
$K^+ + e^-$	$\rightleftharpoons$	K	– 2,93
$Li^+ + e^-$	$\rightleftharpoons$	Li	– 3,05

Increasing oxidising ability/*Toenemende oksiderende vermoë*

Increasing reducing ability/*Toenemende reduserende vermoë*

TABLE 4B: STANDARD REDUCTION POTENTIALS
TABEL 4B: STANDAARD REDUKSIEPOTENSIALE

Half-reactions/*Halfreaksies*			E^{θ} (V)
$Li^+ + e^-$	$\rightleftharpoons$	Li	− 3,05
$K^+ + e^-$	$\rightleftharpoons$	K	− 2,93
$Cs^+ + e^-$	$\rightleftharpoons$	Cs	− 2,92
$Ba^{2+} + 2e^-$	$\rightleftharpoons$	Ba	− 2,90
$Sr^{2+} + 2e^-$	$\rightleftharpoons$	Sr	− 2,89
$Ca^{2+} + 2e^-$	$\rightleftharpoons$	Ca	− 2,87
$Na^+ + e^-$	$\rightleftharpoons$	Na	− 2,71
$Mg^{2+} + 2e^-$	$\rightleftharpoons$	Mg	− 2,36
$A\ell^{3+} + 3e^-$	$\rightleftharpoons$	$A\ell$	− 1,66
$Mn^{2+} + 2e^-$	$\rightleftharpoons$	Mn	− 1,18
$Cr^{2+} + 2e^-$	$\rightleftharpoons$	Cr	− 0,91
$2H_2O + 2e^-$	$\rightleftharpoons$	$H_2(g) + 2OH^-$	− 0,83
$Zn^{2+} + 2e^-$	$\rightleftharpoons$	Zn	− 0,76
$Cr^{3+} + 3e^-$	$\rightleftharpoons$	Cr	− 0,74
$Fe^{2+} + 2e^-$	$\rightleftharpoons$	Fe	− 0,44
$Cr^{3+} + e^-$	$\rightleftharpoons$	Cr^{2+}	− 0,41
$Cd^{2+} + 2e^-$	$\rightleftharpoons$	Cd	− 0,40
$Co^{2+} + 2e^-$	$\rightleftharpoons$	Co	− 0,28
$Ni^{2+} + 2e^-$	$\rightleftharpoons$	Ni	− 0,27
$Sn^{2+} + 2e^-$	$\rightleftharpoons$	Sn	− 0,14
$Pb^{2+} + 2e^-$	$\rightleftharpoons$	Pb	− 0,13
$Fe^{3+} + 3e^-$	$\rightleftharpoons$	Fe	− 0,06
$2H^+ + 2e^-$	**$\rightleftharpoons$**	**$H_2(g)$**	**0,00**
$S + 2H^+ + 2e^-$	$\rightleftharpoons$	$H_2S(g)$	+ 0,14
$Sn^{4+} + 2e^-$	$\rightleftharpoons$	Sn^{2+}	+ 0,15
$Cu^{2+} + e^-$	$\rightleftharpoons$	Cu^+	+ 0,16
$SO_4^{2-} + 4H^+ + 2e^-$	$\rightleftharpoons$	$SO_2(g) + 2H_2O$	+ 0,17
$Cu^{2+} + 2e^-$	$\rightleftharpoons$	Cu	+ 0,34
$2H_2O + O_2 + 4e^-$	$\rightleftharpoons$	$4OH^-$	+ 0,40
$SO_2 + 4H^+ + 4e^-$	$\rightleftharpoons$	$S + 2H_2O$	+ 0,45
$Cu^+ + e^-$	$\rightleftharpoons$	Cu	+ 0,52
$I_2 + 2e^-$	$\rightleftharpoons$	$2I^-$	+ 0,54
$O_2(g) + 2H^+ + 2e^-$	$\rightleftharpoons$	H_2O_2	+ 0,68
$Fe^{3+} + e^-$	$\rightleftharpoons$	Fe^{2+}	+ 0,77
$NO_3^- + 2H^+ + e^-$	$\rightleftharpoons$	$NO_2(g) + H_2O$	+ 0,80
$Ag^+ + e^-$	$\rightleftharpoons$	Ag	+ 0,80
$Hg^{2+} + 2e^-$	$\rightleftharpoons$	$Hg(\ell)$	+ 0,85
$NO_3^- + 4H^+ + 3e^-$	$\rightleftharpoons$	$NO(g) + 2H_2O$	+ 0,96
$Br_2(\ell) + 2e^-$	$\rightleftharpoons$	$2Br^-$	+ 1,07
$Pt^{2+} + 2e^-$	$\rightleftharpoons$	Pt	+ 1,20
$MnO_2 + 4H^+ + 2e^-$	$\rightleftharpoons$	$Mn^{2+} + 2H_2O$	+ 1,23
$O_2(g) + 4H^+ + 4e^-$	$\rightleftharpoons$	$2H_2O$	+ 1,23
$Cr_2O_7^{2-} + 14H^+ + 6e^-$	$\rightleftharpoons$	$2Cr^{3+} + 7H_2O$	+ 1,33
$C\ell_2(g) + 2e^-$	$\rightleftharpoons$	$2C\ell^-$	+ 1,36
$MnO_4^- + 8H^+ + 5e^-$	$\rightleftharpoons$	$Mn^{2+} + 4H_2O$	+ 1,51
$H_2O_2 + 2H^+ + 2e^-$	$\rightleftharpoons$	$2H_2O$	+1,77
$Co^{3+} + e^-$	$\rightleftharpoons$	Co^{2+}	+ 1,81
$F_2(g) + 2e^-$	$\rightleftharpoons$	$2F^-$	+ 2,87

Increasing oxidising ability/*Toenemende oksiderende vermoë*

Increasing reducing ability/*Toenemende reduserende vermoë*