LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF EDUCATION

NATIONAL SENIOR CERTIFICATE

GRADE 12

PHYSICAL SCIENCES: CHEMISTRY (P2)

JUNE 2026

MARKS: 150

TIME: 3 hours

MYEPHSCP2

This question paper consists of 11 pages, 4 data sheets.

INSTRUCTIONS AND INFORMATION

1. Write your name and surname (and centre number if applicable) in the appropriate spaces on the ANSWER BOOK/ANSWER SHEET.
2. This question paper consists of NINE questions. Answer ALL the questions in the ANSWER BOOK.
3. Start EACH question on a NEW page in the ANSWER BOOK.
4. Non-programmable calculators may be used.
5. Appropriate mathematical instruments may be used.
6. Leave ONE line between two sub questions, e.g. between QUESTION 2.1 and QUESTION 2.2.
7. Number the answers correctly according to the numbering system used in this question paper.
8. Data sheets are attached for your use.
9. Wherever motivations, discussions, et cetera, are required, be brief.
10. Show ALL formulae and substitutions in ALL calculations.
11. Write neatly and legibly.

QUESTION1: MULTIPLE CHOICE QUESTIONS

Four possible options are provided as possible answers to the following questions. Each question has only ONE correct answer. Choose the correct answer and write only the letter (A – D) next to the question number (1.1 – 1.10) in the ANSWER BOOK, e.g. 1.11 E

1.1 Which one of the following is a functional isomer of ethyl propanoate?

A. CH_3-CH_2-O-CO-CH_2-CH_3
B. CH_3-COO-CH_2-CH_2-CH_3
C. CH_3-CH_2-CH_2-CH_2-CH_3
D. CH_3-CH_2-CH_2-CH_2-COOH

(2)

1.2 Which one of the following compounds has the lowest melting point?

A. $CH_3CH_2CH_2CH_2OH$
B. CH_3CH_2COOH
C. CH_3COOCH_3
D. $CH_3CH_2CH(OH)CH_3$

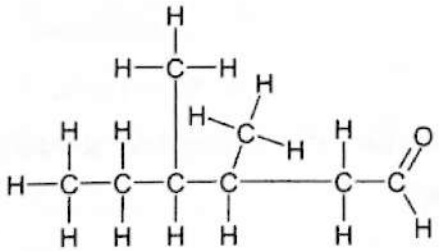
(2)

1.3 When a few drops of compound A are added to bromine water, the bromine water rapidly changes colour from red-brown to colourless. Compound A could be:

A. Pentanoic acid
B. An alcohol
C. 2-methylpent-1-ene
D. A saturated hydrocarbon

(2)

1.4 What is the correct IUPAC name of the following organic molecule?



A. 3,4 – dimethylpentanal
B. 3,4 – dimethylhexanal
C. 4 – ethyl – 3 – methylpentanal
D. 3,4 – dimethylhexan – 1 - one

(2)

1.5 Which ONE of the following compounds will react with sodium hydroxide in a neutralisation reaction?

A. CH_3COOH

B. CH_3CHO

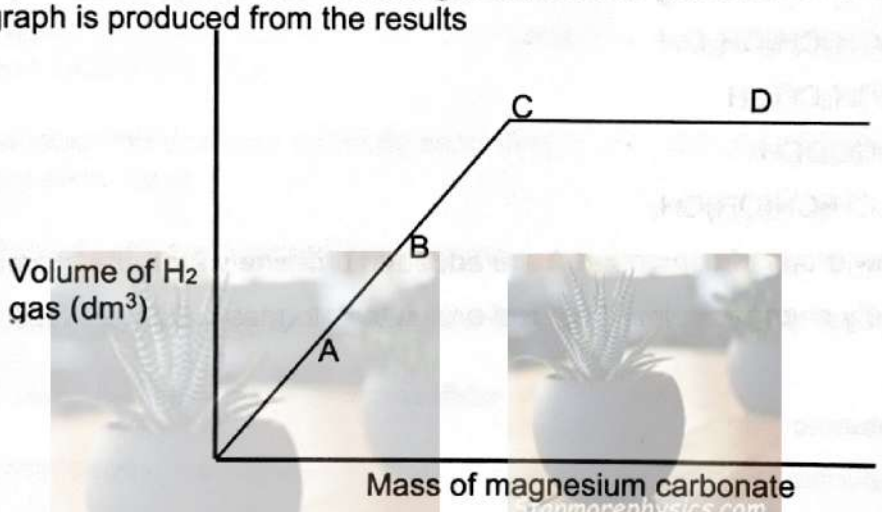
C. Ch_3COOCH_3

D. $CH_3CH_2CH_2OH$ (2)

1.6 Magnesium carbonate reacts with nitric acid according to the following chemical equation:

$MgCO_3(s) + 2HNO_3(aq) \rightarrow Mg(NO_3)_2(aq) + CO_2(g) + H_2O(l)$

In an investigation varying masses of magnesium carbonate are added to equal amounts of nitric acid the gas released is collected. The following graph is produced from the results



From point C it may be deduced that there is …

A. Dynamic equilibrium

B. An excess of $MgCO_3$

C. An excess of HNO_3

D. No excess of either reactant (2)

1.7 For a certain reaction that has reached equilibrium, the value of K_c at 300°C is $1,2 \times 10^{-8}$. What does this value of K_c imply?

A. The rate of reaction is very low.

B. The forward reaction produces a small amount of product.

C. The forward reaction produces a large amount of product.

D. The rate of reaction is very high. (2)

1.8 The following reaction has reached equilibrium at 40°C.

$AgC\ell(s) \rightleftharpoons Ag^+(aq) + C\ell^-(aq)$

A few drops of concentrated HCℓ are added to the above equilibrium mixture without significantly changing the volume and temperature of the mixture.

Which one of the following combinations best describes the possible effect on the equilibrium constant K_c and the concentration of Ag^+ ions?

K_c	$[Ag^+]$
A. Remains the same	Increases
B. Increases	Increases
C. Decreases	Remains the same
D. Remains the same	Decrease

(2)

1.9 Consider the reaction represented by the balanced equation below:

$HNO_3(aq) + H_2O(\ell) \rightleftharpoons H_3O^+(aq) + NO_3^-(aq)$

Which ONE of the following is a conjugate acid - base pair?

A. $H_3O^+(aq)$ and $H_2O(\ell)$

B. $HNO_3(aq)$ and $H_2O(\ell)$

C. $HNO_3(aq)$ and $H_3O^+(aq)$

D. $H_3O^+(aq)$ and $NO_3^-(aq)$

(2)

1.10 The table below shows pH ranges for some indicators which can be used during titration reaction.

INDICATORS	**pH RANGES**
Methyl red	4,8 – 6,2
Bromothymol blue	6,0 – 7,6
Methyl orange	3,2 – 4,4
Phenolphthalein	8,0 – 10,0

Which ONE of the indicators is best suited for the titration of ethanoic acid and sodium hydroxide?

A. Phenolphthalein

B. Methyl orange

C. Methyl red

D. Bromothymol blue

(2)

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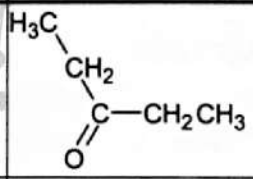
QUESTION 2

The table below represents organic compounds. Study the table and answer the questions that follow.

A	$CH_3CH_2CH_2CH_2COH$	**B**	CH_3-CHF-CH_2-$C(CH_3)_3$
C		**D**	C_7H_{14}
E	$CH_3(CH_2)_2OH$	**F**	Propyl ethanoate

2.1 Define the term functional isomers. (2)

2.2 Write down the letters that represent functional isomers. (1)

2.3 Write down the IUPAC name of:

2.3.1 Compound **B.** (3)

2.3.2 Compound **C.** (2)

2.4 Draw the structural formula of:

2.4.1 Functional group of compound A. (2)

2.4.2 Compound D. (2)

2.5 Compound **E is** an alcohol which can be used for the preparation of compound F.

2.5.1 Draw the structural formula of compound F. (2)

2.5.2 During the preparation of compound F, sulphuric acid and sodium carbonate are used. Write down one function of each of the underlined compounds in terms of this reaction. (2)

2.5.3 Using structural formulae, write down a balanced equation for the formation of compound F. (4)

2.5.4 Write down the name of reaction for this process. (2)

2.5.5 Write down the name/formula of the inorganic product formed. (1)

2.6 Consider compound D:

When bromine water (Br_2) is added to this compound in a test tube, the bromine water decolourises.

2.6.1 To which homologous series does compound D belong? (1)

2.6.2 Using molecular formulae, write down a balanced equation for this reaction. (4)

[28]

QUESTION 3

The melting and boiling points of four organic compounds are compared under the same conditions.

Compound	Name	Melting point	Boiling point
A	Propan – 1 - ol	-127	97
B	Propan – 2 – ol	-90	82
C	Propanoic acid	-21	141
D	Propanal	-81	**P**

3.1 Define the term vapour pressure. (2)

3.2 Which compound, A or B, has the higher vapour pressure? (1)

3.3 Explain your answer to 3.2 by referring to the structures of the compounds. (3)

3.4 Is this comparison between compound A and B fair or unfair? Give a reason to your answer. (3)

3.5 In which phase will Propanoic acid be at room temperature? Write only GAS, LIQUID or SOLID. Give a reason for your choice. (3)

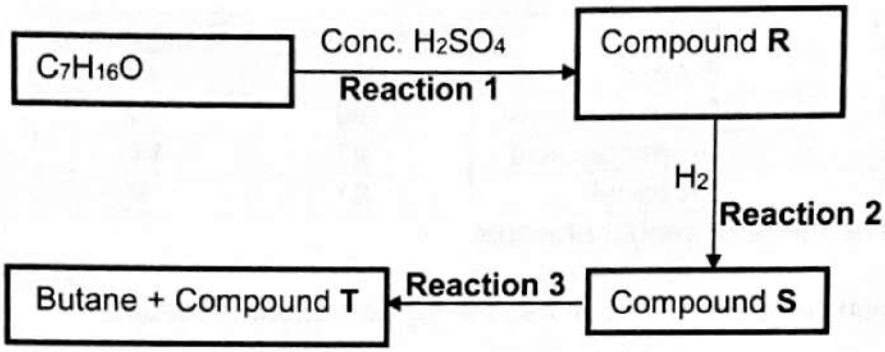
3.6 Explain the difference in boiling point between compound B and compound C by referring to their intermolecular forces. (4)

3.7 Compounds C and D are now compared. With reference to the table, state whether the value of P (boiling point of propanal) will be **Higher** or **Lower** than that of propanoic acid? Explain your answer by referring to the **strength** of the intermolecular forces between molecules of the two compounds. (5)

[21]

QUESTION 4

The flow diagram below shows different organic reactions. Compounds R, S and T are organic compounds.



4.1 Consider **Reaction 1**, Write down:

4.1.1 The TYPE of reaction. (1)

4.1.2 IUPAC name of compound **R**. (2)

4.2 Consider **reaction 2**.

4.2.1 Write down the STRUCTURAL formula of compound S. (2)

4.2.2 What is the condition required for this reaction to take place? (1)

4.3 Compound S undergoes cracking to form butane and compound T in reactions 3 and 4 respectively.

4.3.1 Define the term 'cracking'. (2)

4.3.2 Write the balanced equation for this reaction using STRUCTURAL FORMULAE. (3)

4.3.3 Write down the IUPAC name of compound **T**. (2)

4.4 Using molecular formulae, write a balanced equation for the complete combustion of butane. (3)

4.5 Butane is allowed to react with chlorine under certain reaction conditions.

4.5.1 Write down the condition required for this reaction to take place. (1)

4.5.2 Write down the type of reaction that takes place. (1)

4.5.3 Write down the structural formula of the compound that is formed. (2)

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QUESTION 5

Learners from a certain school performed an experiment to investigate factors that affect the rate of a reaction. They reacted zinc granules and zinc powder with sulphuric acid of the same concentration. The balanced chemical equation for the reaction that takes place is:

$$Zn(s) + H_2SO_4(aq) \rightarrow ZnSO_4(aq) + H_2(g)$$

5.1 Define the term rate of reaction. (2)

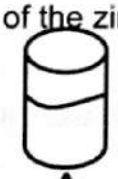
5.2 Which factor affecting the rate of reaction are they investigating? (1)

5.3 Quote a phrase from the statement above that suggests that this is a fair test. (2)

5.3.1 In which reaction (granules or powder), will the reaction be faster? (1)

5.3.2 Use the collision theory to explain your answer in 5.4.1 (2)

5.4 In a second experiment, they use only zinc powder. They use the same volumes of a 0.1mol/dm^3 and a 0.01mol/dm^3 solution of sulphuric acid. The mass of the zinc powder used is the same.



A

0.1mol/dm^3 H_2SO_4

B

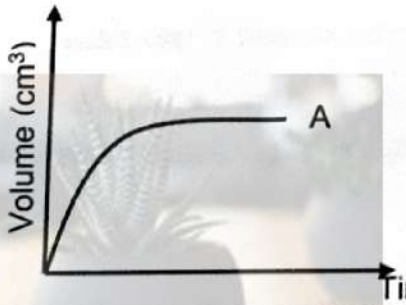
0.01mol/dm^3 H_2SO_4

5.4.1 Write down the independent variable for this investigation. (1)

5.4.2 Write down the investigative question for this investigation. (2)

The graph below represents the volume of H_2 gas produced when a 0.1mol/dm^3 solution of sulphuric acid was used.

5.5



5.5.1 What does the flat portion of the graph indicate? (2)

5.5.2 Redraw the graph in your answer sheet/book. On the same set of axis, draw the graph the 0.01mol/dm^3 solution. Label it B. (3)

[16]

QIUESTION 6

6.1 Ammonia, (NH_3) is produced in the Haber process at a temperature of around 500^{0}C. Iron is used as a catalyst. The balanced chemical equation for the reaction which reaches equilibrium in a 1dm^3 container is:

$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$ $\triangle H = -19.8kJ/mol$

6.1.1 Define the term chemical equilibrium. (2)

6.1.2 During the production of ammonia, a certain number of moles of nitrogen was mixed with 0.3mol of hydrogen and allowed to reach equilibrium. At equilibrium, it was found that 0.2mol of the initial amount of hydrogen was used up. The K_c value for this reaction 36. Calculate the initial amount of nitrogen that was pumped into the reaction vessel. (9)

6.2 Certain changes were made to the equilibrium conditions. What effect will they have on the YIELD of NH_3? Write only INCREASES, DECREASES or STAYS THE SAME.

6.2.1 More N_2 added to the mixture. (1)

6.2.2 Increase in temperature. Use Le Chatelier's principle to explain your choice (4)

6.2.3 Pressure decreased. Use Le Chatelier's principle to explain your choice. (4)

6.2.4 A catalyst is added. Explain your answer. (3)

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QUESTION 7

7.1 Sulphuric acid is a diprotic acid which can be ionised in two steps:

First Ionization Step: $H_2SO_4(aq) + H_2O(l) \rightleftharpoons HSO_4^-(aq) + H_3O^+(aq)$

Second Ionization Step: $HSO_4^-(aq) + H_2O(l) \rightleftharpoons SO_4^{2-}(aq) + H_3O^+(aq)$

7.1.1 Define the term diprotic acid. (2)

7.1.2 Define the term ampholyte. (2)

7.1.3 Write down the formulae of substances from the two steps which act as ampholyte. (2)

7.2 In an attempt to determine the concentration of sulphuric acid in a toilet cleaning product, learners from a certain school added 20 cm^3 of the toilet cleaner to a 250cm^3 volumetric flask and added water up to the mark. 28,2 cm^3 of this solution was neutralised by 25 cm^3 of potassium hydroxide of concentration 0,2 $mol.dm^{-3}$.

7.2.1 Calculate the number of moles of hydroxide ions, OH^-, in the potassium hydroxide solution. (3)

The balanced equation for the neutralisation reaction is;

$2NaOH\ (aq) + H_2SO_4\ (aq) \longrightarrow Na_2SO_4(aq) + 2H_2O$

7.2.2 Calculate the concentration of sulphuric acid in the toilet cleaner. (5)

7.2.3 What is the most suitable indicator for this reaction? Give a reason for your choice. (3)

7.3 The products used at the hair salon to relax hair, contains sodium hydroxide as one of the ingredients. It was found during a titration experiment that the concentration of the sodium hydroxide in the hair relaxer is 0,01 $mol.dm^3$. Calculate the pH of the sodium hydroxide in the hair relaxer product. (5)

[22]

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DATA FOR PHYSICAL SCIENCES GRADE 12

PAPER 2 (CHEMISTRY)
GEGEWENS VIR FISIESE WETENSKAPPE GRAAD 12

VRAESTEL 2 (CHEMIE)

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

NAME/*NAAM*	SYMBOL/*SIMBOOL*	VALUE/*WAARDE*
Standard pressure *Standaarddruk*	p^θ	$1{,}013 \times 10^5$ Pa
Molar gas volume at STP *Molêre gasvolume by STD*	V_m	22,4 $dm^3 \cdot mol^{-1}$
Standard temperature *Standaardtemperatuur*	T^θ	273 K
Charge on electron *Lading op elektron*	e	$-1{,}6 \times 10^{-19}$ C
Avogadro's constant *Avogadro se konstante*	N_A	$6{,}02 \times 10^{23}$ mol^{-1}

TABLE 2: FORMULAE / *TABEL 2: FORMULES*

$n = \frac{m}{M}$	$n = \frac{N}{N_A}$
$c = \frac{n}{V}$ OR/OF $c = \frac{m}{MV}$	$n = \frac{V}{V_M}$
$\frac{c_a V_a}{c_b V_b} = \frac{n_a}{n_b}$	pH = - log[H_3O^+]
$K_w = [H_3O^+][OH^-] = 1 \times 10^{-14}$ at/by 298 K	
$E^\theta_{cell} = E^\theta_{cathode} - E^\theta_{anode}$ / $E^\theta_{sel} = E^\theta_{katode} - E^\theta_{anode}$ Or/of $E^\theta_{cell} = E^\theta_{reduction} - E^\theta_{oxidation}$ / $E^\theta_{sel} = E^\theta_{reduksie} - E^\theta_{oksidasie}$ Or/of $E^\theta_{cell} = E^\theta_{oxidising\ agent} - E^\theta_{reducing\ agent}$ / $E^\theta_{sel} = E^\theta_{oksideermiddel} - E^\theta_{reduseer\ middel}$	

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 **H** 1																	2 **He** 4
1,0 **Li** 7	1,5 **Be** 9											2,0 **B** 11	2,5 **C** 12	3,0 **N** 14	3,5 **O** 16	4,0 **F** 19	**Ne** 20
0,9 **Na** 23	1,2 **Mg** 24											1,5 **Aℓ** 27	1,8 **Si** 28	2,1 **P** 31	2,5 **S** 32	3,0 **Cℓ** 35,5	**Ar** 40
0,8 **K** 39	1,0 **Ca** 40	1,3 **Sc** 45	1,5 **Ti** 48	1,6 **V** 51	1,6 **Cr** 52	1,5 **Mn** 55	1,8 **Fe** 56	1,8 **Co** 59	1,8 **Ni** 59	1,9 **Cu** 63,5	1,6 **Zn** 65	1,6 **Ga** 70	1,8 **Ge** 73	2,0 **As** 75	2,4 **Se** 79	2,8 **Br** 80	**Kr** 84
0,8 **Rb** 86	1,0 **Sr** 88	1,2 **Y** 89	1,4 **Zr** 91	**Nb** 92	1,8 **Mo** 96	1,9 **Tc**	2,2 **Ru** 101	2,2 **Rh** 103	2,2 **Pd** 106	1,9 **Ag** 108	1,7 **Cd** 112	1,7 **In** 115	1,8 **Sn** 119	1,9 **Sb** 122	2,1 **Te** 128	2,5 **I** 127	**Xe** 131
0,7 **Cs** 133	0,9 **Ba** 137	**La** 139	1,6 **Hf** 179	**Ta** 181	**W** 184	**Re** 186	**Os** 190	**Ir** 192	**Pt** 195	**Au** 197	**Hg** 201	1,8 **Tℓ** 204	1,8 **Pb** 207	1,9 **Bi** 209	2,0 **Po**	2,5 **At**	**Rn**
0,7 **Fr**	0,9 **Ra** 226	**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*

Atomic number
Atoomgetal

Electronegativity
Elektronegatiwiteit

29 Cu 63,5

Symbol
Simbool

Approximate relative atomic mass
Benaderde relatiewe atoommassa

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

Increasing oxidising ability/*Toenemende oksiderende vermoë* ↑

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

Increasing reducing ability/*Toenemende reduserende vermoë* ↓

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

Increasing oxidising ability/Toenemende oksiderende vermoë ↓

Increasing reducing ability/Toenemende reduserende vermoë ↑

Half-reactions/*Halfreaksies*			E^{θ} (V)
$Li^+ + e^-$	⇌	Li	− 3,05
$K^+ + e^-$	⇌	K	− 2,93
$Cs^+ + e^-$	⇌	Cs	− 2,92
$Ba^{2+} + 2e^-$	⇌	Ba	− 2,90
$Sr^{2+} + 2e^-$	⇌	Sr	− 2,89
$Ca^{2+} + 2e^-$	⇌	Ca	− 2,87
$Na^+ + e^-$	⇌	Na	− 2,71
$Mg^{2+} + 2e^-$	⇌	Mg	− 2,36
$Al^{3+} + 3e^-$	⇌	Al	− 1,66
$Mn^{2+} + 2e^-$	⇌	Mn	− 1,18
$Cr^{2+} + 2e^-$	⇌	Cr	− 0,91
$2H_2O + 2e^-$	⇌	$H_2(g) + 2OH^-$	− 0,83
$Zn^{2+} + 2e^-$	⇌	Zn	− 0,76
$Cr^{3+} + 3e^-$	⇌	Cr	− 0,74
$Fe^{2+} + 2e^-$	⇌	Fe	− 0,44
$Cr^{3+} + e^-$	⇌	Cr^{2+}	− 0,41
$Cd^{2+} + 2e^-$	⇌	Cd	− 0,40
$Co^{2+} + 2e^-$	⇌	Co	− 0,28
$Ni^{2+} + 2e^-$	⇌	Ni	− 0,27
$Sn^{2+} + 2e^-$	⇌	Sn	− 0,14
$Pb^{2+} + 2e^-$	⇌	Pb	− 0,13
$Fe^{3+} + 3e^-$	⇌	Fe	− 0,06
$2H^+ + 2e^-$	⇌	$H_2(g)$	0,00
$S + 2H^+ + 2e^-$	⇌	$H_2S(g)$	+ 0,14
$Sn^{4+} + 2e^-$	⇌	Sn^{2+}	+ 0,15
$Cu^{2+} + e^-$	⇌	Cu^+	+ 0,16
$SO_4^{2-} + 4H^+ + 2e^-$	⇌	$SO_2(g) + 2H_2O$	+ 0,17
$Cu^{2+} + 2e^-$	⇌	Cu	+ 0,34
$2H_2O + O_2 + 4e^-$	⇌	$4OH^-$	+ 0,40
$SO_2 + 4H^+ + 4e^-$	⇌	$S + 2H_2O$	+ 0,45
$Cu^+ + e^-$	⇌	Cu	+ 0,52
$I_2 + 2e^-$	⇌	$2I^-$	+ 0,54
$O_2(g) + 2H^+ + 2e^-$	⇌	H_2O_2	+ 0,68
$Fe^{3+} + e^-$	⇌	Fe^{2+}	+ 0,77
$NO_3^- + 2H^+ + e^-$	⇌	$NO_2(g) + H_2O$	+ 0,80
$Ag^+ + e^-$	⇌	Ag	+ 0,80
$Hg^{2+} + 2e^-$	⇌	$Hg(\ell)$	+ 0,85
$NO_3^- + 4H^+ + 3e^-$	⇌	$NO(g) + 2H_2O$	+ 0,96
$Br_2(\ell) + 2e^-$	⇌	$2Br^-$	+ 1,07
$Pt^{2+} + 2e^-$	⇌	Pt	+ 1,20
$MnO_2 + 4H^+ + 2e^-$	⇌	$Mn^{2+} + 2H_2O$	+ 1,23
$O_2(g) + 4H^+ + 4e^-$	⇌	$2H_2O$	+ 1,23
$Cr_2O_7^{2-} + 14H^+ + 6e^-$	⇌	$2Cr^{3+} + 7H_2O$	+ 1,33
$Cl_2(g) + 2e^-$	⇌	$2Cl^-$	+ 1,36
$MnO_4^- + 8H^+ + 5e^-$	⇌	$Mn^{2+} + 4H_2O$	+ 1,51
$H_2O_2 + 2H^+ + 2e^-$	⇌	$2H_2O$	+1,77
$Co^{3+} + e^-$	⇌	Co^{2+}	+ 1,81
$F_2(g) + 2e^-$	⇌	$2F^-$	+ 2,87