higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

PHYSICAL SCIENCE

(Second paper)

NQF LEVEL 3

(10021003)

30 November 2023 (X-paper)
09:00–12:00

Nonprogrammable calculators may be used.

This question paper consists of 10 pages, 1 answer sheet, 1 periodic table , 1 data sheet and 2 information sheets.

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DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)
PHYSICAL SCIENCE
NQF LEVEL 3
TIME: 3 HOURS
MARKS: 150

INSTRUCTIONS AND INFORMATION

1. Answer all the questions.
2. Read all the questions carefully.
3. Number the answers according to the numbering system used in this question paper.
4. Write your EXAMINATION NUMBER and CENTRE NUMBER in the appropriate spaces on the ANSWER BOOK.
5. Approximate all final answers to two decimals.
6. Show the formulae and substitutions in all calculations.
7. Use only a black or blue pen.
8. Write neatly and legibly.

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SECTION A

QUESTION 1

Give ONE word/term for each of the following descriptions. Write ONLY the word/term next to the question number (1.1 – 1.5) in the ANSWER BOOK.

1.1 The collective name for elements with eight valence electrons.

1.2 The property of a substance that enables it to be bent and hammered into shape.

1.3 The type of chemical bond in which electrons are delocalised.

1.4 The gas that is released by plants during photosynthesis.

1.5 A chemical reaction in which the enthalpy change is negative.

(5 × 1) **[5]**

QUESTION 2

Choose an item from COLUMN B that matches a description in COLUMN A. Write only the letter (A−J) next to the question number (2.1−2.5) in the ANSWER BOOK.

COLUMN A		COLUMN B	
2.1	Gas used in some fire extinguishers	A	non-volatile
2.2	Net change in potential energy during a chemical reaction	B	CO
2.3	Occurs when bonding electrons are shared unequally	C	covalent bond
2.4	Strong intermolecular forces	D	activation energy
2.5	Liquids that have a low vapour	E	CO_2
		F	metallic bonding
		G	volatile
		H	heat of the reaction
		I	hydrogen bonding
		J	polar covalent bond

(5 × 1) **[5]**

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QUESTION 3

Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only 'True' or 'False' next to the question number (3.1–3.5) in the ANSWER BOOK.

3.1 Evaporation does not take place at temperatures below 0 °C.

3.2 Two moles of H_2SO_4 contain two moles of sulphur.

3.3 The oxidation state of carbon in CO_2 is -4.

3.4 5 moles of oxygen gas (O_2) will occupy the same volume as 5 moles of carbon dioxide gas (CO_2) at the same temperature and pressure.

3.5 A catalyst increases the rate of a reaction by lowering the activation energy.

(5 ×2) **[10]**

QUESTION 4

Various options are given as possible answers to the following questions. Choose the answer and write only the letter (A−D) next to the question number (4.1 − 4.5) in the ANSWER BOOK.

4.1 The following equation illustrates one of the steps in the industrial production of nitric oxide from ammonia:

$$4NH_3 + 5O_2 \longrightarrow 4NO + 6H_2O + \text{heat}$$

This reaction can be described as:
(i) exothermic
(ii) endothermic
(iii) redox

Which ONE of the following combinations is correct?

A (i) only
B (ii) only
C (i) and (iii)
D (ii) and (iii)

4.2 Some table salt is added to a beaker of pure water.

Which ONE of the following correctly describes the changes to the vapour pressure and boiling point of the pure water, if any?

	VAPOUR PRESSURE	BOILING POINT
A	Decreases	Increases
B	Decreases	No change
C	Increases	Decreases
D	Increases	No change

4.3 The earth radiates infrared radiation (heat). The carbon dioxide and water vapour in the earth's atmosphere absorbs this energy and then re-radiates it. Some of this re-radiated energy is directed back down to the earth's surface instead of escaping into space.

This phenomenon is called …

A solar wind.
B greenhouse effect.
C lightening.
D thermal stress.

4.4 During a displacement reaction between potassium bromide and chlorine, xylene was added to the mixture. The xylene turned brownish because of …

A $C\ell^-$
B Br_2
C $C\ell_2$
D Br^-

4.5 A metal M forms a salt with a formula of $M_2(SO_4)_3$.

What is the valency of metal M in this compound?

A 4
B 5
C 2
D 3

(3 × 5) **[15]**

TOTAL SECTION A: 35

SECTION B

QUESTION 5

5.1 A student investigated the relationship between the load on a rubber band and its length of extension. She made the following observations:

A rubber band is 5,3 cm long when unloaded. It stretches to a length of 8,9 cm when subjected to a load of 1,5 N and to a length of 12,5 cm when subjected to a load of 3,0 N.

The results are tabulated below:

LENGTH OF RUBBER BAND (cm)	LENGTH OF EXTENSION (cm)	LOAD (N)
5,3	0	0
8,9	3,6	1,5
10,1	**Y**	2,0
12,5	7,2	3,0

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5.1.1 State Hooke's Law. (2)

5.1.2 What is the value of **Y** in the table? (1)

5.1.3 Use the data supplied to draw a graph of the length of extension versus the load on the GRAPH PAPER attached to this question paper. (4)

5.1.4 Does the rubber band obey Hooke's Law? (1)

5.1.5 Give a reason for your answer in QUESTION 5.1.4. (2)

5.2 Consider the sulphide ion (S^{-2}).

5.2.1 Write down the sp-notation for the sulphide ion. (3)

5.2.2 Draw the Lewis diagram of a sulphide ion. (2)

5.2.3 Write the chemical formula of TWO ions that are isoelectronic to the sulphide ion. (2)

5.3 From the list supplied, choose a compound that fits the description given:

CO_2 PH_3 NH_3 H_2O HF

5.3.1 A non-polar molecule with polar bonds.

5.3.2 A tetrahedral, non-polar molecule.

(2 × 1) (2)

[19]

QUESTION 6

6.1 A certain amount of nitrogen gas is sealed in a container with a volume of 3,6 dm^3 at a temperature of 55 °C and a pressure of 125 kPa.

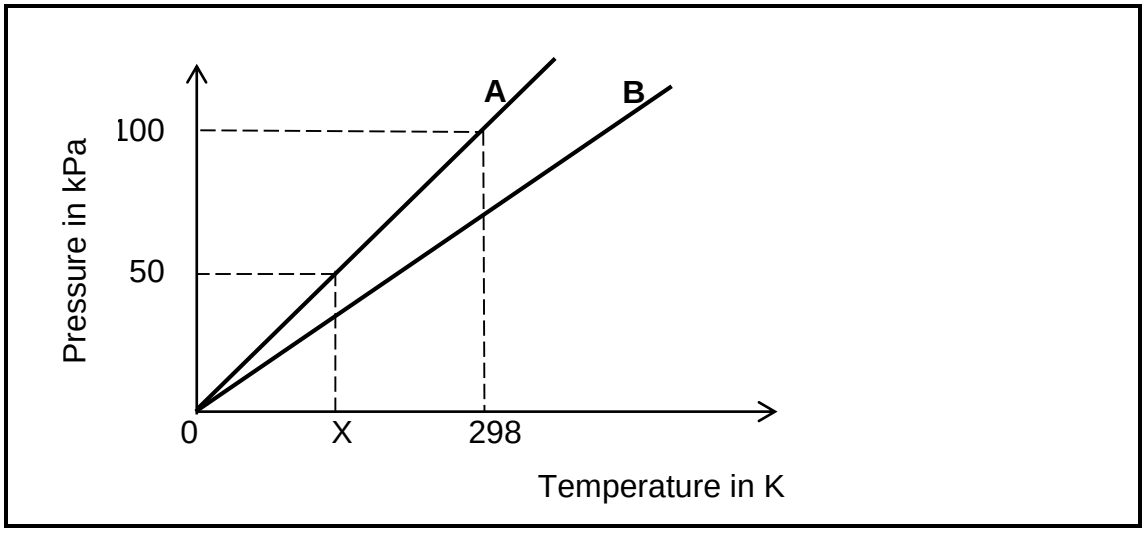
6.1.1 Calculate the number of moles of nitrogen gas present in the container. (5)

6.1.2 Calculate the mass of nitrogen gas present in the container. (3)

6.2 A group of L3 learners investigates the relationship between the pressure and temperature of an enclosed gas at constant volume. The learners use different samples of the same gas in two identical containers, A and B.

From the data collected, they plotted the following graphs:

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6.2.1 Write a suitable conclusion for this investigation. (2)

6.2.2 Determine the value of temperature X shown on the graph in °C. (4)

6.2.3 Explain, using the relevant formulae, why graph B has a smaller gradient than graph A. (4)

[18]

QUESTION 7

7.1 Define the following terms:

7.1.1 Vapour pressure.

7.1.2 Boiling point.

(2 × 2) (4)

7.2 Briefly explain why solids expand when they are heated. (3)

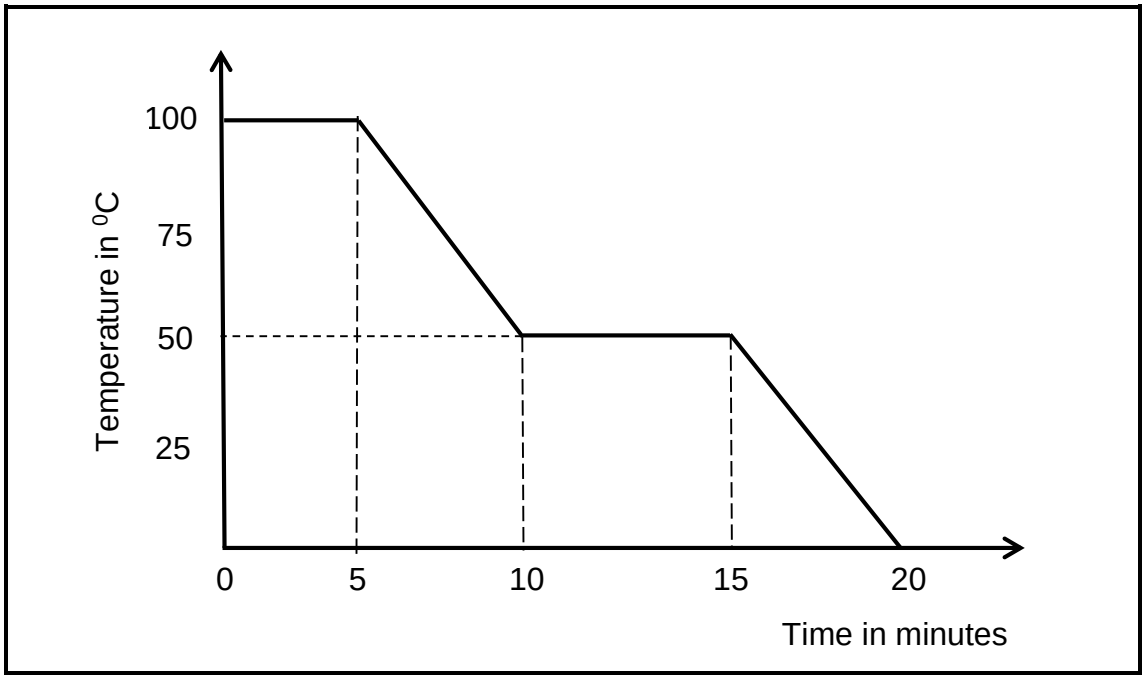
7.3 State the predominant intermolecular forces that are found in the following:

7.3.1 Liquid ammonia.

7.3.2 Chlorine gas.

(2 × 1) (2)

7.4 The graph below shows the change in temperature of a substance as it cools at constant pressure.



7.4.1 What is the state of the substance between the 5th and 10th minute? (2)

7.4.2 Why is there no temperature change between the 10th and 15th minute? (2)

7.4.3 What is the melting point of this substance? (1)

[14]

QUESTION 8

8.1 Define the following terms:

8.1.1 Catalyst.

8.1.2 Enthalpy.

(2 × 2) (4)

8.2 Methanol reacts with excess oxygen to produce carbon dioxide, water and heat.

8.2.1 Is this reaction exothermic or endothermic? (1)

8.2.2 Give a reason for the answer to QUESTION 8.2.1. (2)

8.2.3 Write a balanced chemical equation for this reaction. (3)

8.2.4 Draw a graph illustrating the potential energy changes during the course of this reaction.

Indicate the following on the graph:
- Labels on the axes.
- Potential energy of the reactants and products.
- Activation energy and ΔH for the reaction. (6)

8.3 In order to demonstrate the lime water cycle during the ISAT practical, a group of L3 learners placed 30 g of calcium oxide (CaO) in a beaker and slowly added sufficient water to fully cover the calcium oxide. The chemical equation for the reaction is:

$$CaO + H_2O \longrightarrow Ca(OH)_2$$

8.3.1 Write the balanced chemical equation for this reaction. (1)

8.3.2 What type of reaction is this? (2)

8.3.3 Calculate the number of moles of calcium oxide placed in the beaker. (3)

8.3.4 Prove that mass is conserved in this reaction. (4)

[26]

QUESTION 9

9.1 The following reaction represents a precipitation reaction:

$$AgNO_3(aq) + NaC\ell(aq) \longrightarrow AgC\ell(s) + NaNO_3(aq)$$

9.1.1 Supply the correct chemical name for each of the following:

(a) $AgNO_3$

(b) $NaC\ell$

(c) $AgC\ell$

(d) $NaNO_3$

(4 × 1) (4)

9.1.2 Calculate the mass of the precipitate formed if an excess of $AgNO_3$ solution is added to a solution that contains 10 g of $NaC\ell$ solution. (6)

9.2 Complete and balance the following chemical equations. State whether each of the reactions are combination, displacement or decomposition

9.2.1 $C\ell_2$ + KBr ⟶

9.2.2 N_2 + H_2 ⟶

9.2.3 $KC\ell O_3$(s) + heat + catalyst ⟶

(3 × 4) (12)

9.3 Calculate the mass of 44,8 dm^3 ethene gas (C_2H_4) at STP. (6)
[28]

QUESTION 10

10.1 Although gases have many important uses, many industrial gases need to be carefully controlled as they may be poisonous or damaging.

Define the following terms related to industrial emissions:

10.1.1 Ozone layer.

10.1.2 Global warming.

10.1.3 Pollutants.

(3 × 2) (6)

10.2 Complete the following sentences by using the words provided in the list below. Write only the word or words next to the question number (10.2.1–10.2.4) in the ANSWER BOOK

Nitrogen; Methane; Carbon dioxide; Ammonia; Oxygen

10.2.1 … is used as an inert gas to prevent oxidation.

10.2.2 … is used to support life during respiration.

10.2.3 … is produced inside internal combustion engines.

10.2.4 … is a highly flammable clean fuel.

(4 × 1) (4)
[10]

TOTAL SECTION B: 115
GRAND TOTAL: 150

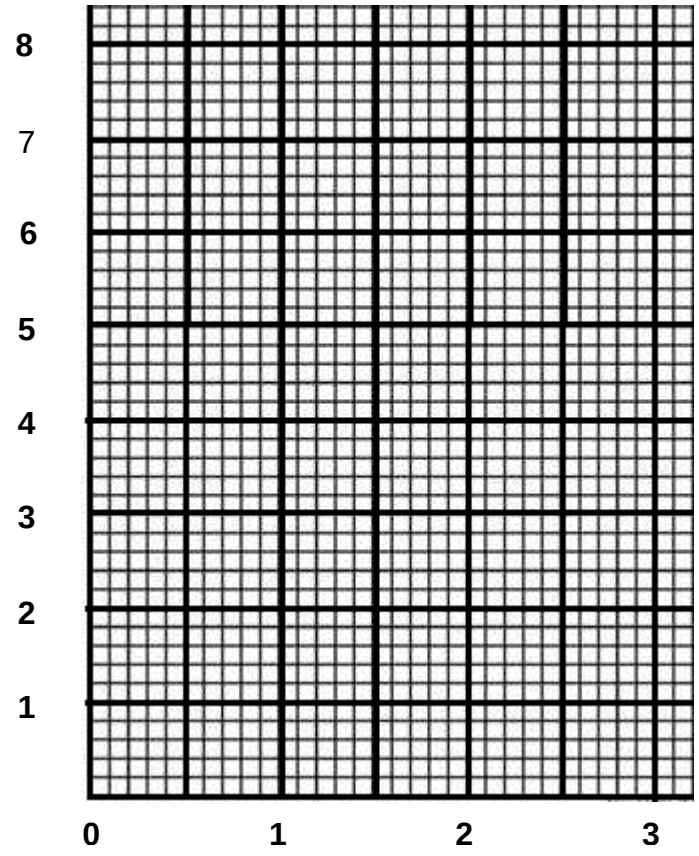
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ANSWER SHEET **EXAMINATION NUMBER:**

QUESTION 5

5.1 5.1.3

Tear off and place under the front cover of your answer booklet.



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DATA FOR PHYSICAL SCIENCES
PAPER 2 (CHEMISTRY)

TABLE 1: PHYSICAL CONSTANTS

NAME	SYMBOL	VALUE
Avogadro's constant	N_A	$6{,}02 \times 10^{23}$ mol^{-1}
Molar gas constant	R	8,31 J·K^{-1}·mol^{-1}
Standard pressure	p^θ	$1{,}013 \times 10^5$ Pa
Molar gas volume at STP	V_m	22,4 dm^3·mol^{-1}
Standard temperature	T^θ	273 K

TABLE 2: FORMULAE

$\frac{p_1V_1}{T_1} = \frac{p_2V_2}{T_2}$	$pV = nRT$
$n = \frac{m}{M}$	$n = \frac{N}{N_A}$
$n = \frac{V}{V_m}$	$c = \frac{n}{V}$ OR $c = \frac{m}{MV}$

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TABLE 3: THE PERIODIC TABLE OF ELEMENTS

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																	**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

Atomic number

Electronegativity → 29 / 1,9 / Cu / 63,5 ← Symbol

Approximate relative atomic mass

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TABLE 4A: STANDARD REDUCTION POTENTIALS

***Halfreaksies*/Half-reactions**			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

***Toenemende oksiderende vermoë*/Increasing oxidising ability** ↑

***Toenemende reduserende vermoë*/Increasing reducing ability** ↓

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TABLE 4B: STANDARD REDUCTION POTENTIALS

Increasing oxidising ability/*Toenemende oksiderende vermoë* ↓

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	− 2,37
$A\ell^{3+} + 3e^-$	$\rightleftharpoons$	$A\ell$	− 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 reducing ability/*Toenemende reduserende vermoë* ↑

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