



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

TECHNICAL SCIENCES P2

NOVEMBER 2018

MARKS: 150

TIME: 3 hours

This question paper consists of 15 pages and 4 data sheets.



INSTRUCTIONS AND INFORMATION

1. Write your centre number and examination number in the appropriate spaces on the ANSWER BOOK.
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. Number the answers correctly according to the numbering system used in this question paper.
5. Leave ONE line between two subquestions, e.g. 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. Give brief motivations, discussions, etc. where required.
10. 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 1.10) in the ANSWER BOOK, e.g. 1.11 D.

- 1.1 Which ONE of the following homologous series represents a hydrocarbon?
- A Aldehydes
 - B Alkynes
 - C Ketones
 - D Alcohols (2)
- 1.2 The general formula of the haloalkanes is ...
- A C_nH_{2n}
 - B C_nH_{2n-2}
 - C C_nH_{2n+2}
 - D $C_nH_{2n+1}X$ (2)
- 1.3 When petrol, which is a mixture of alkanes used in car engines, reacts with oxygen, the reaction is known as a/an ... reaction.
- A hydrohalogenation
 - B substitution
 - C oxidation
 - D addition (2)



1.4 Study the two organic compounds I and II below.

I	II
$ \begin{array}{ccccc} & \text{H} & \text{H} & \text{H} & \\ & & & & \\ \text{H} & - \text{C} & - \text{C} & - \text{C} & - \text{H} \\ & & & & \\ & \text{H} & \text{H} & \text{H} & \end{array} $	2-bromobutane

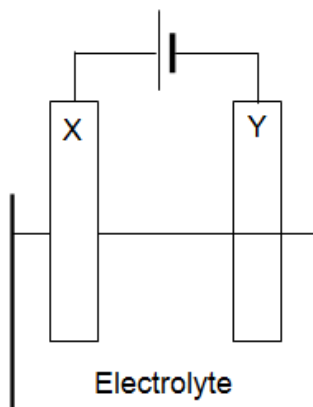
Which ONE of the following combinations represents the correct functional group to which compound I and compound II belong?

	I	II
A	$ \begin{array}{c} \\ - \text{C} - \text{O} \\ \quad \quad \quad \\ \quad \quad \quad \quad \quad \text{H} \end{array} $	$ \begin{array}{c} \diagup \quad \diagdown \\ \text{C} = \text{C} \\ \diagdown \quad \diagup \end{array} $
B	$- \text{C} \equiv \text{C} -$	$ \begin{array}{c} \\ - \text{C} - \text{X} \\ \end{array} $
C	$ \begin{array}{cc} & \\ - \text{C} & - \text{C} - \\ & \end{array} $	$ \begin{array}{c} \\ - \text{C} - \text{X} \\ \end{array} $
D	$ \begin{array}{c} \diagup \quad \diagdown \\ \text{C} = \text{C} \\ \diagdown \quad \diagup \end{array} $	$ \begin{array}{c} \quad \quad \quad \text{O} \\ \quad \quad \quad // \\ - \text{C} - \text{C} - \text{O} - \text{H} \\ \quad \quad \quad \quad \quad \quad \quad \end{array} $

(2)



QUESTIONS 1.5 and 1.6 are based on the diagram below.



- 1.5 In the electrochemical cell shown in the diagram ...
- A oxidation occurs at X.
 - B oxidation occurs at Y.
 - C reduction occurs at X.
 - D oxidation and reduction occur at X first and thereafter at Y. (2)
- 1.6 Which ONE of the statements below is CORRECT regarding the electrochemical cell represented in the diagram above?
- A It is a galvanic cell and the reaction is spontaneous.
 - B It is an electrolytic cell and the reaction is spontaneous.
 - C It is a galvanic cell and the reaction is non-spontaneous.
 - D It is an electrolytic cell and the reaction is non-spontaneous. (2)
- 1.7 When the angle of incidence is greater than the critical angle and the ray of light reflects into the original medium, then ...
- A total internal reflection occurs.
 - B the speed of the light ray increases.
 - C the speed of light ray decreases.
 - D the wavelength of the light ray increases. (2)

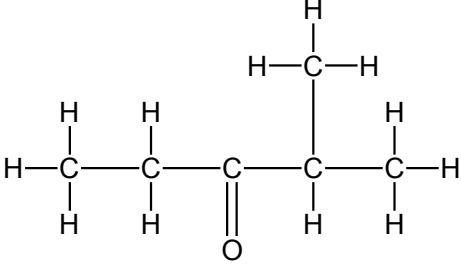
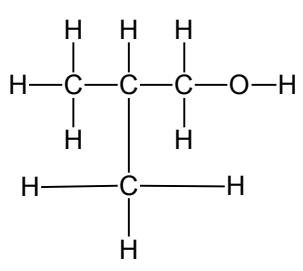
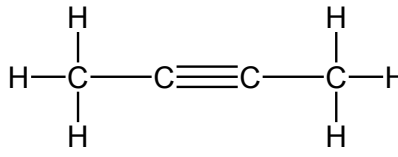


- 1.8 What is the dependant variable in an experiment to determine the path of a ray of light through a glass prism at different angles of incidence?
- A Angle of incidence
 - B Angle of reflection
 - C Angle of refraction
 - D Critical angle (2)
- 1.9 Light consists of quanta (packets of energy) known as ...
- A clusters.
 - B photons.
 - C galaxies.
 - D spectrum. (2)
- 1.10 When the frequency of a certain electromagnetic wave is X Hz, its wavelength is Y m. By which factor will the wavelength change when the frequency is doubled?
- A 4
 - B 2
 - C $\frac{1}{2}$
 - D $\frac{1}{4}$ (2)

[20]

QUESTION 2 (Start on a new page.)

The letters **A** to **F** in the table below represent SIX organic compounds from different functional groups.

A		B	But-1-yne
C		D	Butane
E	2-methylbutanal	F	

- 2.1 Define the term *functional group*. (2)
- 2.2 Write the NAME of the functional group to which the following compounds belong:
- 2.2.1 **A** (1)
- 2.2.2 **C** (1)
- 2.3 Write down the:
- 2.3.1 Name of the homologous series of compound **A** (1)
- 2.3.2 IUPAC name of compound **F** (2)
- 2.3.3 Structural formula of compound **E** (3)
- 2.3.4 Letters representing structural isomers (1)
- 2.3.5 Letter representing a compound which is an alcohol (1)
- 2.3.6 Structural formula of the isomer of compound **D** (2)
- 2.3.7 Letter representing a saturated compound (1)

[15]

QUESTION 3 (Start on a new page.)

Study the boiling points of the organic compounds below with their respective relative molecular masses.

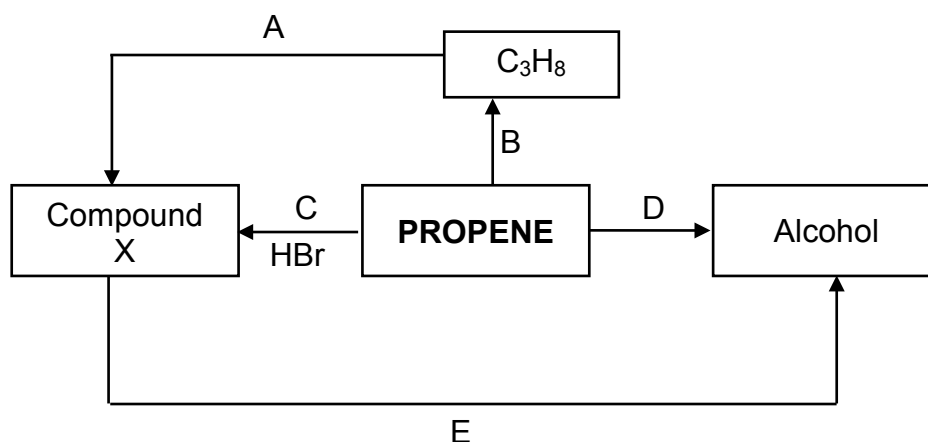
COMPOUND	RELATIVE MOLECULAR MASS	BOILING POINT (°C)
Methanol	32	65
Ethanol	46	78,5
1-propanol	59	97
1-butanol	74	117

- 3.1 Define the term *homologous series*. (2)
- 3.2 Consider the boiling points of the four compounds in the table above.
- 3.2.1 Identify the homologous series to which the above compounds belong. (1)
- 3.2.2 Identify the strongest type of intermolecular forces acting on the molecules of the above compounds. (1)
- 3.2.3 Describe the trend in the boiling points of these compounds. (2)
- 3.2.4 Explain the trend in the boiling points of these compounds. Refer to CHAIN LENGTH, STRENGTH OF INTERMOLECULAR FORCES and the ENERGY needed. (3)
- 3.2.5 Which ONE of the above compounds will have the highest vapour pressure? (1)
- 3.2.6 Explain the answer to QUESTION 3.2.5 by referring to the boiling point. (2)
- 3.3 How does the boiling point of ETHANE compare to that of ETHANOL? Write down only LESS THAN, GREATER THAN or EQUAL TO. (1)
- 3.4 Explain the answer to QUESTION 3.3. (3)
- [16]**

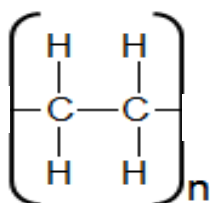


QUESTION 4 (Start on a new page.)

The flow diagram below shows some of the reactions of propene.



- 4.1 What TYPE of addition reaction is represented by EACH of the following letters?
- 4.1.1 **B** (1)
- 4.1.2 **D** (1)
- 4.1.3 **C** (1)
- 4.2 C_3H_8 is one of the gases used in cigarette lighters. Write down a balanced equation for the combustion of C_3H_8 in excess oxygen. (3)
- 4.3 Write down the name of compound **X**. (2)
- 4.4 Consider reaction **E**.
- 4.4.1 Name the type of reaction represented by **E**. (1)
- 4.4.2 Name TWO reaction conditions necessary for the reaction to take place. (2)
- 4.5 Polythene is an example of a polymer typically used to manufacture plastic. The structural formula of polythene is shown below.

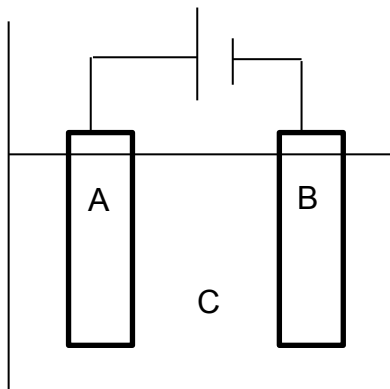


- 4.5.1 Define the term *plastic*. (2)
- 4.5.2 Name the monomer used to form polythene. (1)
- 4.5.3 Name ONE use of polythene. (1)

[15]

QUESTION 5 (Start on a new page.)

The diagram below shows the electrolysis of CuCl_2 .

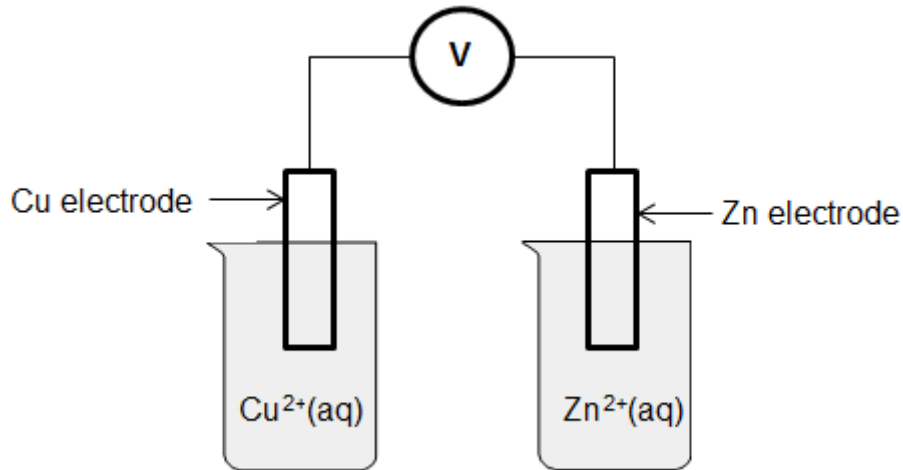


- 5.1 Define *electrolysis*. (2)
- 5.2 Write down the NAME or FORMULA of the following:
- 5.2.1 Electrode **A** (1)
- 5.2.2 Electrode **B** (1)
- 5.2.3 Electrolyte **C** (1)
- 5.3 What energy conversion takes place in this cell? (2)
- 5.4 What is observed at the following electrodes?
- 5.4.1 **A** (1)
- 5.4.2 **B** (1)
- 5.5 Write the NAME or FORMULA of the product formed at electrode **A**. (1)
- 5.6 Identify the reducing agent. (1)
- 5.7 Write down the half reaction that occurs at the:
- 5.7.1 Anode (2)
- 5.7.2 Cathode (2)
- 5.8 Which ions, CATIONS or ANIONS, move to the:
- 5.8.1 Cathode (1)
- 5.8.2 Anode (1)

[17]

QUESTION 6 (Start on a new page.)

The diagram below represents an INCOMPLETE Zn-Cu galvanic cell.

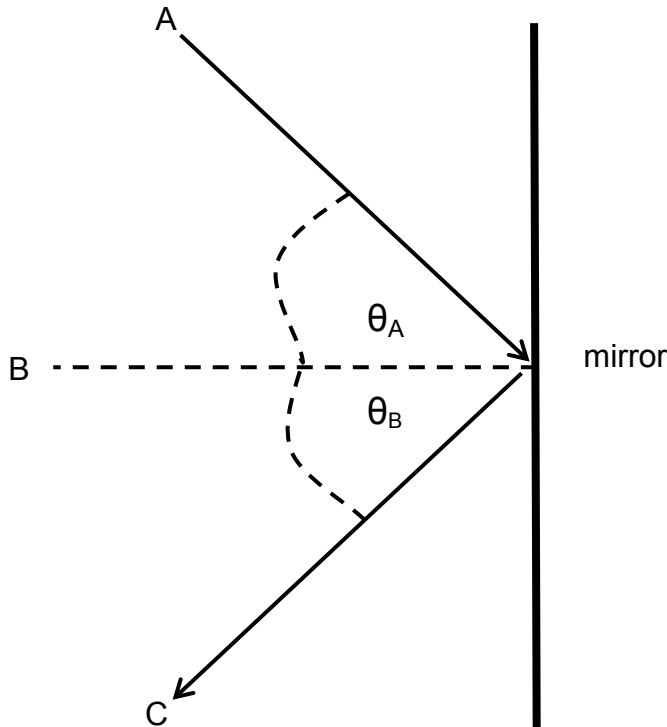


- 6.1 Define a *galvanic cell*. (2)
- 6.2 What will be the reading on the voltmeter? (1)
- 6.3 Explain the answer to QUESTION 6.2. (2)
- 6.4 Write down the NAME of the missing component. (1)
- 6.5 What is the function of the missing component? (2)
- 6.6 The Zn-Cu cell is now complete.
- 6.6.1 In which direction will the electrons flow? Write only FROM ANODE TO CATHODE or FROM CATHODE TO ANODE. (1)
- 6.6.2 Give the standard conditions under which this cell operates. (2)
- 6.6.3 Write down the net reaction of this cell. (3)
- 6.6.4 Write down the cell notation of this cell. (3)
- 6.7 South Africa, like many other countries, is opting for alternative sources of energy to keep up with the demand for electricity. The most popular form of alternative energy in South Africa, for both rural and urban populations, is rooftop photovoltaic solar energy.
- 6.7.1 State TWO environmental advantages of using solar energy in South Africa. (2)
- 6.7.2 Why is this form of electrical energy the most popular form in comparison with other forms of energy? (2)

[21]

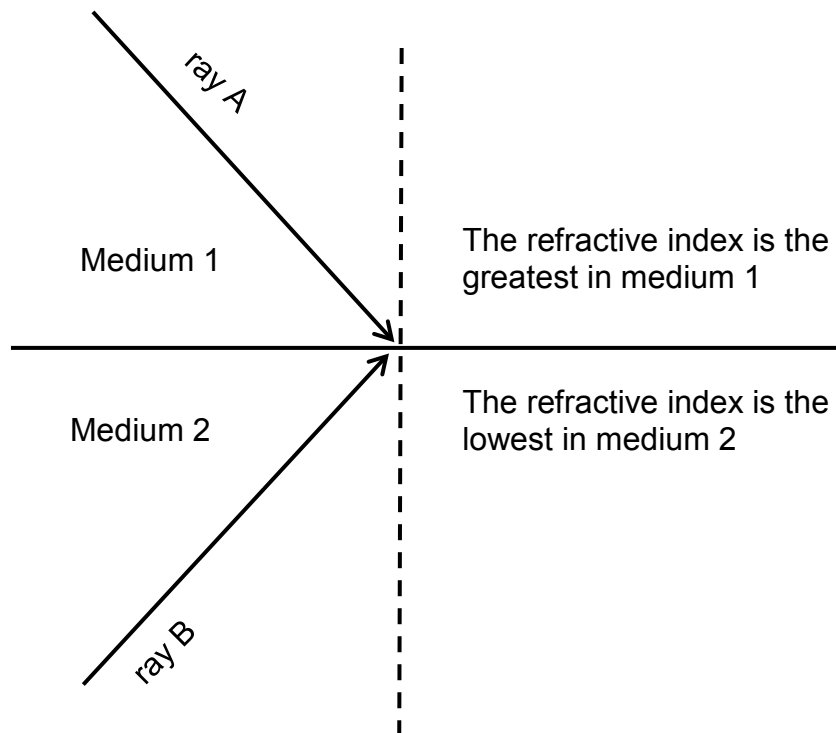
QUESTION 7 (Start on a new page.)

Study the diagram below and answer questions that follow.



- 7.1 State the *law of reflection*. (2)
- 7.2 Identify the following in the diagram:
- 7.2.1 **A** (1)
- 7.2.2 **B** (1)
- 7.2.3 **C** (1)
- 7.3 7.3.1 When angle θ_A increases, how will the value of θ_B change? Write down only INCREASE, DECREASE or REMAIN THE SAME. (1)
- 7.3.2 Explain the answer to QUESTION 7.3.1. (2)

7.4 Study the diagram below and answer the questions that follow.



- 7.4.1 Which light ray, **A** or **B**, will undergo total internal reflection if the incident angle is gradually increased? (1)
- 7.4.2 Give a reason for the answer to QUESTION 7.4.1. (2)
- 7.4.3 State TWO uses of total internal reflecting prisms. (2)

7.5 The reflection of an object in a flat mirror is shown in the picture below.



[Source: www.grandadscience.com/2010/08/two-of-you.html]

- 7.5.1 Is the image UPRIGHT or INVERTED? (1)
- 7.5.2 Is the image REAL or is it VIRTUAL? (1)
- 7.5.3 Explain the answer to QUESTION 7.5.2. (2)

[17]



QUESTION 8 (Start on a new page.)

8.1 Study the picture below and answer the questions that follow.

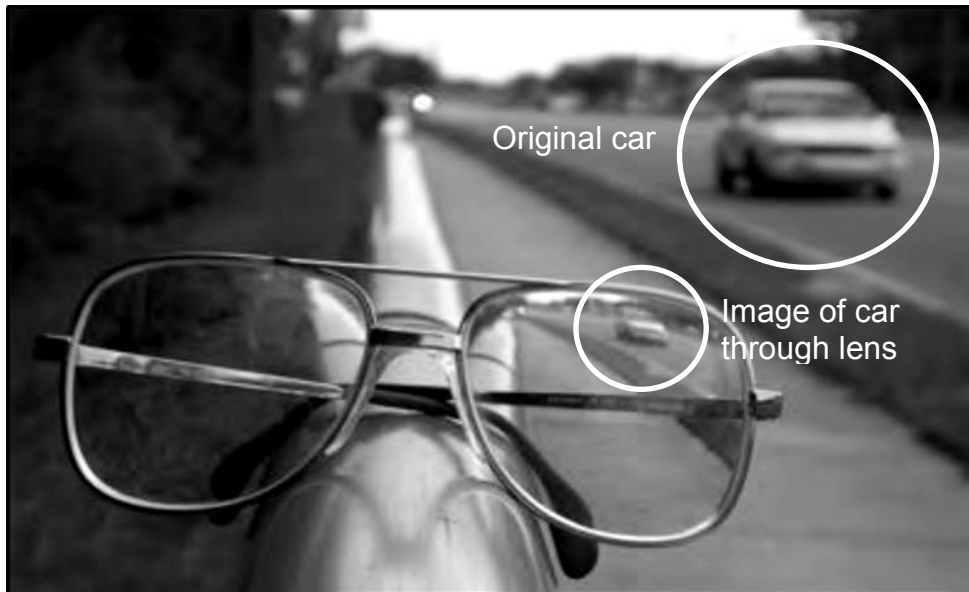


[Source: <http://physics.tutorvista.com/light/index-of-refraction.html>]

- 8.1.1 Name the property of light, as observed in the picture. (1)
- 8.1.2 Explain the observation made in QUESTION 8.1.1. (3)
- 8.2 A certain lens forms an upright (erect) image for all positions of the object placed in front of the lens.
- 8.2.1 Is the lens CONVEX or CONCAVE? (1)
- 8.2.2 What happens when a ray of light passes through the optical centre of a lens? (1)
- 8.3 An object is placed in front of a converging lens.
- 8.3.1 Draw a ray diagram to indicate the position and size of the image formed when the object is placed between the focal point and $2F$ (use an arrow to represent the object). (5)
- 8.3.2 When a convex lens is used, where should an object be placed so that a real and inverted image of the same size is obtained? (1)
- 8.3.3 What is a *virtual image*? (2)



- 8.4 In the picture below the car seen through the lens of the glasses is smaller than the actual car and the image is upright.



[Source: *OpenstaxCollege_College-Physics*, p. 915]

- 8.4.1 Identify the type of lens used in the glasses (spectacles). (1)
- 8.4.2 Which eyesight problem will this type of lens correct? (1)
- 8.4.3 State TWO properties of the image as seen through these lenses. (2)
- [18]**

QUESTION 9 (Start on a new page.)

Electromagnetic waves can be transmitted through empty space.

- 9.1 Define *electromagnetic waves*. (2)
- 9.2 Soldiers use night-vision devices to see objects at night. Name the electromagnetic radiation used to detect objects in the dark. (1)
- 9.3 Give THREE reasons why ultraviolet light is important in daily life. (3)
- 9.4 Calculate the energy of a photon of light rays with a wavelength 700 nm. (5)
- [11]**

TOTAL: 150



**DATA FOR TECHNICAL SCIENCES GRADE 12
PAPER 2**

**GEGEWENS VIR TEGNIESE WETENSKAPPE GRAAD 12
VRAESTEL 2**

TABLE 1/TABEL 1: PHYSICAL CONSTANTS/FISIIESE KONSTANTES

NAME/NAAM	SYMBOL/SIMBOOL	VALUE/WAARDE
Standard pressure <i>Standaarddruk</i>	p^θ	$1,01 \times 10^5 \text{ Pa}$
Standard temperature <i>Standaardtemperatuur</i>	T^θ	$273 \text{ K}/25^\circ \text{ C}$
Speed of light in a vacuum <i>Spoed van lig in 'n vakuum</i>	c	$3,0 \times 10^8 \text{ m}\cdot\text{s}^{-1}$
Planck's constant <i>Planck se konstante</i>	h	$6,63 \times 10^{-34} \text{ J}\cdot\text{s}$

TABLE 2/TABEL 2: WAVES, SOUND AND LIGHT/GOLWE, KLANK EN LIG

$v = f \lambda$	$T = \frac{1}{f}$
$E = hf$ or/of $E = h \frac{c}{\lambda}$	

TABLE 3/TABEL 3: ELECTROCHEMISTRY/ELEKTROCHEMIE

$E_{\text{cell}}^\theta = E_{\text{cathode}}^\theta - E_{\text{anode}}^\theta$ / $E_{\text{sel}}^\theta = E_{\text{katode}}^\theta - E_{\text{anode}}^\theta$
or/of
$E_{\text{cell}}^\theta = E_{\text{reduction}}^\theta - E_{\text{oxidation}}^\theta$ / $E_{\text{sel}}^\theta = E_{\text{reduksie}}^\theta - E_{\text{oksidasie}}^\theta$
or/of
$E_{\text{cell}}^\theta = E_{\text{oxidising agent}}^\theta - E_{\text{reducing agent}}^\theta$ / $E_{\text{sel}}^\theta = E_{\text{oksideermiddel}}^\theta - E_{\text{reduseermiddel}}^\theta$



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

Half-reactions/ <i>Halfreaksies</i>	E^{\ominus} (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
$Cl_2(g) + 2e^- \rightleftharpoons 2Cl^-$	+ 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
$Br_2(l) + 2e^- \rightleftharpoons 2Br^-$	+ 1,07
$NO_3^- + 4H^+ + 3e^- \rightleftharpoons NO(g) + 2H_2O$	+ 0,96
$Hg^{2+} + 2e^- \rightleftharpoons Hg(l)$	+ 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
$Al^{3+} + 3e^- \rightleftharpoons Al$	- 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/ <i>Halfreaksies</i>	E^{\ominus} (V)
$\text{Li}^+ + e^- \rightleftharpoons \text{Li}$	-3,05
$\text{K}^+ + e^- \rightleftharpoons \text{K}$	-2,93
$\text{Cs}^+ + e^- \rightleftharpoons \text{Cs}$	-2,92
$\text{Ba}^{2+} + 2e^- \rightleftharpoons \text{Ba}$	-2,90
$\text{Sr}^{2+} + 2e^- \rightleftharpoons \text{Sr}$	-2,89
$\text{Ca}^{2+} + 2e^- \rightleftharpoons \text{Ca}$	-2,87
$\text{Na}^+ + e^- \rightleftharpoons \text{Na}$	-2,71
$\text{Mg}^{2+} + 2e^- \rightleftharpoons \text{Mg}$	-2,36
$\text{Al}^{3+} + 3e^- \rightleftharpoons \text{Al}$	-1,66
$\text{Mn}^{2+} + 2e^- \rightleftharpoons \text{Mn}$	-1,18
$\text{Cr}^{2+} + 2e^- \rightleftharpoons \text{Cr}$	-0,91
$2\text{H}_2\text{O} + 2e^- \rightleftharpoons \text{H}_2(\text{g}) + 2\text{OH}^-$	-0,83
$\text{Zn}^{2+} + 2e^- \rightleftharpoons \text{Zn}$	-0,76
$\text{Cr}^{3+} + 3e^- \rightleftharpoons \text{Cr}$	-0,74
$\text{Fe}^{2+} + 2e^- \rightleftharpoons \text{Fe}$	-0,44
$\text{Cr}^{3+} + e^- \rightleftharpoons \text{Cr}^{2+}$	-0,41
$\text{Cd}^{2+} + 2e^- \rightleftharpoons \text{Cd}$	-0,40
$\text{Co}^{2+} + 2e^- \rightleftharpoons \text{Co}$	-0,28
$\text{Ni}^{2+} + 2e^- \rightleftharpoons \text{Ni}$	-0,27
$\text{Sn}^{2+} + 2e^- \rightleftharpoons \text{Sn}$	-0,14
$\text{Pb}^{2+} + 2e^- \rightleftharpoons \text{Pb}$	-0,13
$\text{Fe}^{3+} + 3e^- \rightleftharpoons \text{Fe}$	-0,06
$2\text{H}^+ + 2e^- \rightleftharpoons \text{H}_2(\text{g})$	0,00
$\text{S} + 2\text{H}^+ + 2e^- \rightleftharpoons \text{H}_2\text{S}(\text{g})$	+0,14
$\text{Sn}^{4+} + 2e^- \rightleftharpoons \text{Sn}^{2+}$	+0,15
$\text{Cu}^{2+} + e^- \rightleftharpoons \text{Cu}^+$	+0,16
$\text{SO}_4^{2-} + 4\text{H}^+ + 2e^- \rightleftharpoons \text{SO}_2(\text{g}) + 2\text{H}_2\text{O}$	+0,17
$\text{Cu}^{2+} + 2e^- \rightleftharpoons \text{Cu}$	+0,34
$2\text{H}_2\text{O} + \text{O}_2 + 4e^- \rightleftharpoons 4\text{OH}^-$	+0,40
$\text{SO}_2 + 4\text{H}^+ + 4e^- \rightleftharpoons \text{S} + 2\text{H}_2\text{O}$	+0,45
$\text{Cu}^+ + e^- \rightleftharpoons \text{Cu}$	+0,52
$\text{I}_2 + 2e^- \rightleftharpoons 2\text{I}^-$	+0,54
$\text{O}_2(\text{g}) + 2\text{H}^+ + 2e^- \rightleftharpoons \text{H}_2\text{O}_2$	+0,68
$\text{Fe}^{3+} + e^- \rightleftharpoons \text{Fe}^{2+}$	+0,77
$\text{NO}_3^- + 2\text{H}^+ + e^- \rightleftharpoons \text{NO}_2(\text{g}) + \text{H}_2\text{O}$	+0,80
$\text{Ag}^+ + e^- \rightleftharpoons \text{Ag}$	+0,80
$\text{Hg}^{2+} + 2e^- \rightleftharpoons \text{Hg}(\ell)$	+0,85
$\text{NO}_3^- + 4\text{H}^+ + 3e^- \rightleftharpoons \text{NO}(\text{g}) + 2\text{H}_2\text{O}$	+0,96
$\text{Br}_2(\ell) + 2e^- \rightleftharpoons 2\text{Br}^-$	+1,07
$\text{Pt}^{2+} + 2e^- \rightleftharpoons \text{Pt}$	+1,20
$\text{MnO}_2 + 4\text{H}^+ + 2e^- \rightleftharpoons \text{Mn}^{2+} + 2\text{H}_2\text{O}$	+1,23
$\text{O}_2(\text{g}) + 4\text{H}^+ + 4e^- \rightleftharpoons 2\text{H}_2\text{O}$	+1,23
$\text{Cr}_2\text{O}_7^{2-} + 14\text{H}^+ + 6e^- \rightleftharpoons 2\text{Cr}^{3+} + 7\text{H}_2\text{O}$	+1,33
$\text{Cl}_2(\text{g}) + 2e^- \rightleftharpoons 2\text{Cl}^-$	+1,36
$\text{MnO}_4^- + 8\text{H}^+ + 5e^- \rightleftharpoons \text{Mn}^{2+} + 4\text{H}_2\text{O}$	+1,51
$\text{H}_2\text{O}_2 + 2\text{H}^+ + 2e^- \rightleftharpoons 2\text{H}_2\text{O}$	+1,77
$\text{Co}^{3+} + e^- \rightleftharpoons \text{Co}^{2+}$	+1,81
$\text{F}_2(\text{g}) + 2e^- \rightleftharpoons 2\text{F}^-$	+2,87

Increasing oxidising ability/*Toenemende oksiderende vermoë*Increasing reducing ability/*Toenemende reduserende vermoë*

