



Province of the  
**EASTERN CAPE**  
EDUCATION

**NATIONAL  
SENIOR CERTIFICATE**

**GRADE 11**

**NOVEMBER 2018**

**TECHNICAL SCIENCES P2**

**MARKS: 150**

**TIME: 3 hours**



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This question paper consists of pages 18, including 4 data sheets.

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**INSTRUCTIONS AND INFORMATION**

Read the following instructions carefully before answering the questions

1. Write your FULL NAME and SURNAME in the appropriate spaces in the ANSWER BOOK.
2. Answer ALL the questions.
3. Start each question on a NEW page in the ANSWER BOOK.
4. You may use a non-programmable calculator.
5. Appropriate mathematical instruments may be used.
6. Number the answers correctly according to the numbering system used in this question paper.
7. Show ALL formulae and substitutions in ALL calculations.
8. Round off your final numerical answers to a minimum of TWO decimal places.
9. Give brief motivations, discussions et cetera where required.
10. Data sheets and a periodic table are attached for your use.
11. Write neatly and legibly.

**QUESTION 1: MULTIPLE-CHOICE QUESTIONS**

Various options are provided as possible answers to the following questions. Each question has only ONE correct answer. Choose the answer and write only the letter (A–D) next to the question number (1.1–1.10) in the ANSWER BOOK, for example 1.12 G.

- 1.1 A reaction in which electrons are transferred from one substance to another is called ...  
A redox.  
B oxidation.  
C reduction.  
D electrolysis. (2)
- 1.2 Which ONE of the following CORRECTLY describes the energy change that takes place during electroplating?  
A Kinetic energy to chemical energy  
B Electrical to chemical energy  
C Chemical energy to kinetic energy  
D Chemical energy to electrical energy (2)
- 1.3 Which ONE of the following represents the thermodynamic variables?  
A Heat, pressure and volume  
B Heat, work done and pressure  
C Temperature, pressure and volume  
D Temperature, work done and pressure (2)
- 1.4 The amount of heat required to increase the temperature of the whole substance by 1 K is known as ...  
A heat capacity.  
B kinetic energy.  
C internal energy.  
D specific heat capacity. (2)
- 1.5 A system which is not influenced by its surroundings and exchanges heat or matter with the surroundings is said to be ...  
A open.  
B closed.  
C isolated.  
D insulated. (2)
- 1.6 Which ONE of the following is the correct SI unit for heat?  
A °C  
B K  
C kJ  
D J (2)

1.7 Frequency of sound greater than 20 000 Hz is called ...

- A infrasound.
  - B ultrasound.
  - C audible sound.
  - D supersonic.
- (2)

1.8 The distance between two points in phase in a wave is known as ...

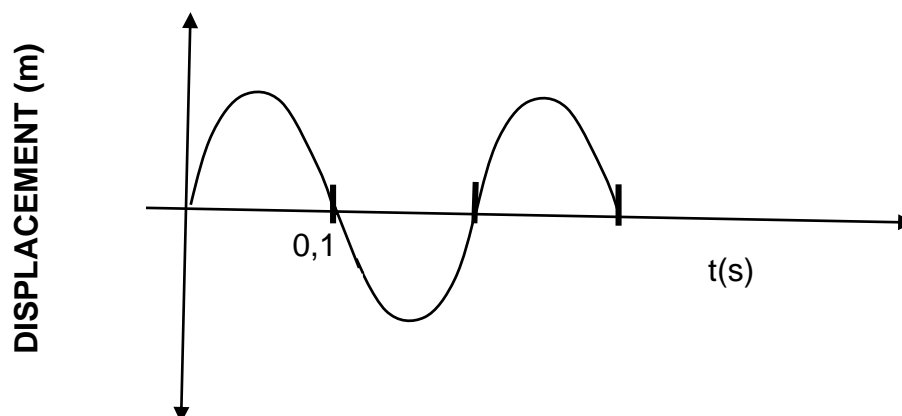
- A pulse.
  - B echo.
  - C amplitude.
  - D wavelength.
- (2)

1.9 A tuning fork **X** produces sound waves of frequency **F** and a wavelength of  $\lambda$ . Another tuning fork **Y** produces sound waves at a frequency double that of tuning fork **X**.

Which ONE of the following is the wavelength of the waves produced by **Y**?

- A  $\lambda$
  - B  $0,5 \lambda$
  - C  $2 \lambda$
  - D  $3 \lambda$
- (2)

1.10 The diagram below shows a transverse wave.



Which ONE of the following CORRECTLY gives the number of COMPLETE waves in the diagram and the FREQUENCY of the wave?

	NUMBER OF COMPLETE WAVES	FREQUENCY
A	1	5
B	1	10
C	2	5
D	2	10

(2)  
[20]

**QUESTION 2**

Consider the reaction and answer questions that follow:



2.1 Define the term *oxidising agent*. (2)

2.2 Write down the:

2.2.1 Oxidation number of the underlined element (2)

2.2.2 Formula of the reducing agent

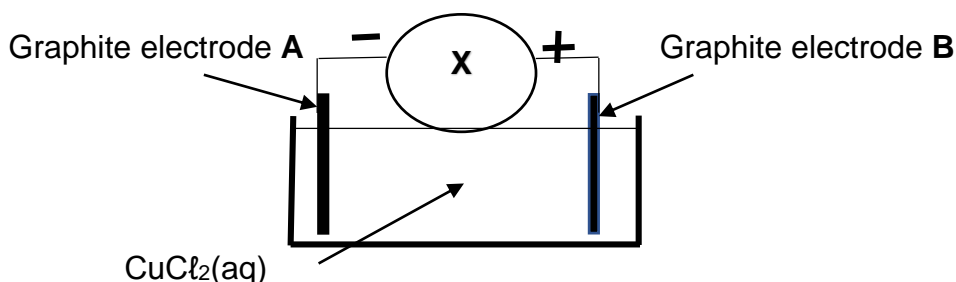
Explain your answer by referring to oxidation numbers. (3)

2.3 Apart from hydrogen ion, write down the NAME of **another** substance in the equation whose oxidation number does not change during the reaction. (1)

**[8]**

**QUESTION 3**

The electrochemical cell below is used during the electrolysis of copper(II) chloride solution ( $\text{CuCl}_2$ ). Graphite electrodes are used in the cell.



3.1 Define the term *electrolysis*. (2)

3.2 Write down ONE observable change:

3.2.1 At electrode **A**  
Give a reason for the answer. (2)

3.2.2 In the solution (1)

3.3 Which electrode is the anode? (**A** or **B**)

Give a reason for the answer. (3)

3.4 Write down the NAME of:

3.4.1 Component **X** (1)

3.4.2 The non-metal that the graphite electrode is made up of (1)

3.5 Give a reason why copper sulphate must be dissolved into the solution before electrolysis takes place. (2)

3.6 Write down the:

3.6.1 NAME or FORMULA of the oxidising agent (2)

3.6.2 Oxidation half reaction (2)

3.6.3 Overall (net) cell reaction (3)

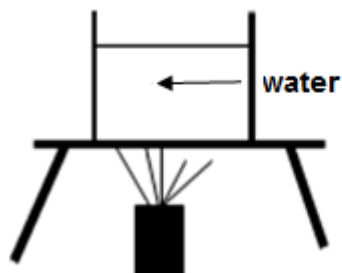
3.7 Two changes are made to the electrochemical cell shown above to make it suitable for electroplating an iron ring with copper metal.

Write down the TWO changes that were made. (4)

**[23]**

**QUESTION 4**

In the diagram below a 0,2 kg stainless-steel pot is used to boil 0,25 kg of water at an initial temperature of 25 °C.



4.1 Define *specific heat capacity*. (2)

4.2 How much heat is needed to:

4.2.1 Boil water (3)

4.2.2 Increase the temperature of the stainless steel pot to 100 °C? (2)

4.3 A motorist notices that bridges are bumpy and have gaps on their surfaces.

The diagram below show sections of bridges.



As a Technical Sciences student, explain to the motorist why a bridge must have gaps. (2)

[9]

**QUESTION 5**

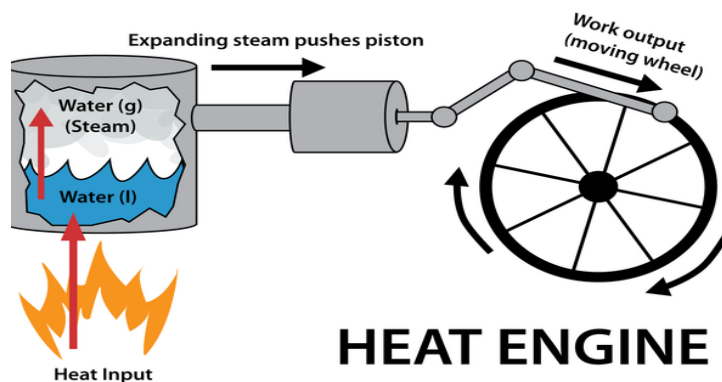
During hot summer days people put ice blocks in water and fizzy drinks to cool them. In the process of cooling, energy is transferred from the hotter substance to the colder substance.

- 5.1 State the law of conservation of heat. (2)
- 5.2 Name the form of *energy* that is transferred from a hotter object to a colder object. (1)
- 5.3 A learner mixes 105 g of water at 20 °C water with 80 g of water at 35 °C.
- 5.3.1 Give a reason why the temperature of the final mixture will be less than 35 °C. (2)
- 5.3.2 Calculate the final temperature of the mixture. (5)
- 5.4 The diagram below shows an aerosol container in which a gas is enclosed. When the container is heated, its lid rises.



The enclosed gas does 10 J of work to raise the lid. The final energy of the system is 2 J.

- 5.4.1 State the first law of thermodynamics in words. (2)
- 5.4.2 Calculate how much energy is added to the system through heating. (3)
- 5.5 In a heat engine, a heat "source" generates thermal energy that brings the working substance to the high temperature state.



- 5.5.1 Define the term *working substance*. (2)
- 5.5.2 Write down the energy conversion that takes place in a heat engine? (2)
- 5.5.3 When is a heat engine efficient? (2)

- 5.6 Just like heat engines, refrigerators have a working substance and a thermostat regulates the process that occurs in the refrigerators.

A learner decides to open the door of a working refrigerator in order to cool a room.

Explain why this idea will not work.

(2)  
[23]

### QUESTION 6

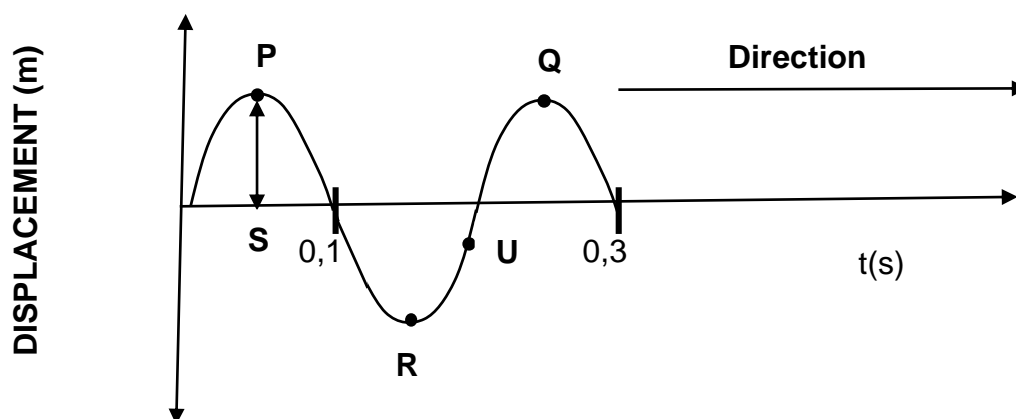
Learners used a tuning fork to produce sound waves.

- 6.1 Define the term *pulse*. (2)
- 6.2 The diagram below represents the wave produced by the tuning fork.



- 6.2.1 Define the term *wave*. (2)
- 6.2.2 Name the type of a wave that is represented by the pattern. (1)
- 6.2.3 Write down the NAME of the part marked:
- (a) **X** (1)
- (b) **Y** (1)
- 6.2.4 Determine by calculation if the sound produced by the turning fork is infrasound given that speed of sound in air is  $343 \text{ m.s}^{-1}$ . (4)

6.3 The diagram below shows a transverse wave.



6.3.1 Write down the letters of TWO points that are in phase. (1)

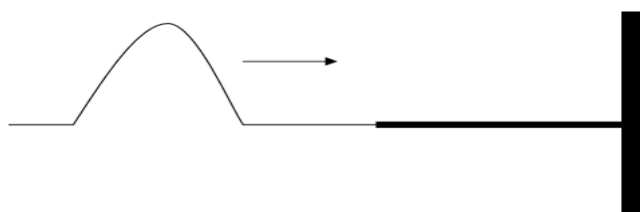
6.3.2 In which direction is point **U** moving?

Write down only UPWARDS or DOWNWARDS (1)

6.3.3 What does length **SP** represent? (1)

6.3.4 Calculate the frequency of the wave. (3)

6.4



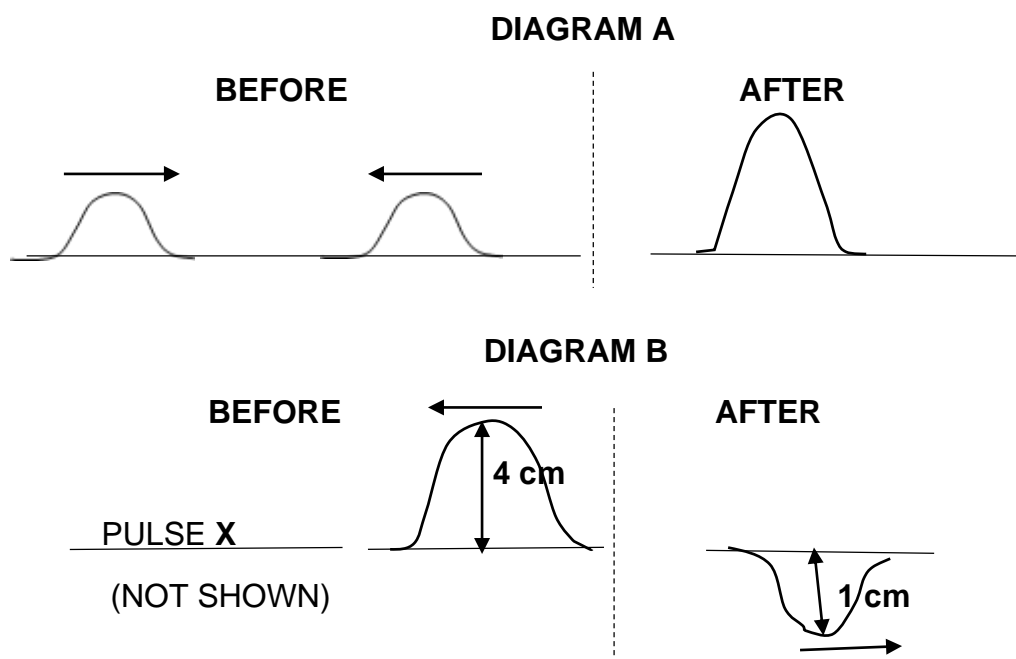
A pulse in the diagram is moving from a thin to a thick rope.

Draw a diagram to show what will happen to the pulse when it enters a thick rope. In the diagram indicate the transmitted and reflected pulses.

(3)  
[20]

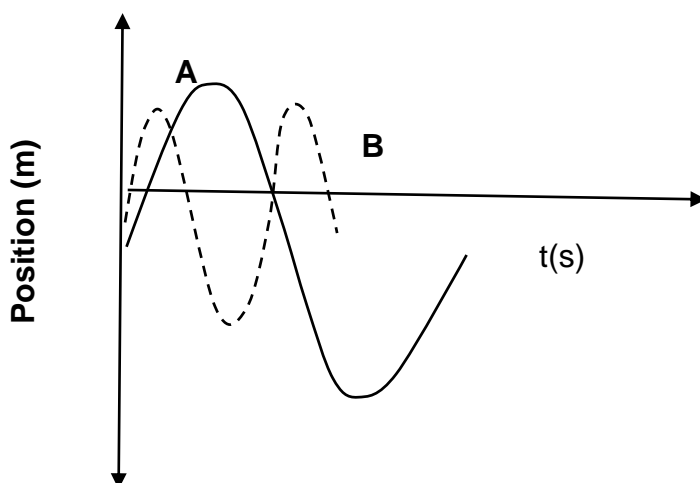
**QUESTION 7**

- 7.1 The diagrams below shows two pulses travelling towards each other BEFORE they meet and immediately AFTER meeting each other.



- 7.1.1 Define the term *interference*. (2)
- 7.1.2 What TYPE of interference takes place in diagram:
- A** (1)
  - B** (1)
- 7.1.3 Draw a diagram for pulse **X** and indicate the magnitude of the amplitude and direction of the pulse in the diagram. (3)

- 7.2 The diagram below shows position-time graph for TWO sound waves.



Which ONE of the sound waves:

- 7.2.1 Is louder (**A** or **B**)? Explain. (3)
- 7.2.2 has a higher pitch (**A** or **B**)? Explain your answer. (3)

7.3 A stationary bat makes a squeaking sound and it takes 0,36 s for a sound wave to be reflected back to the bat. The speed of sound in the air is  $343 \text{ m.s}^{-1}$ .

7.3.1 Can sound travel through vacuum? Yes or No. (1)

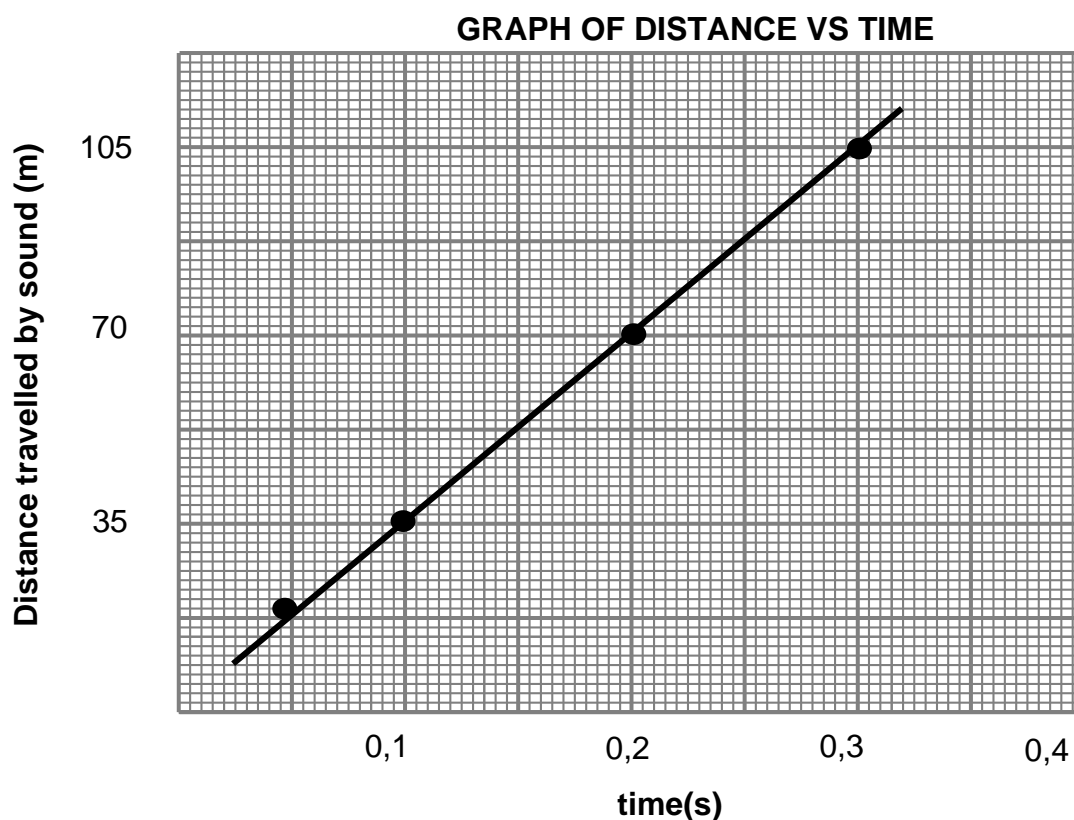
7.3.2 Calculate the distance the bat is from the surface from which the wave is reflected. (4)  
**[18]**

### QUESTION 8

A group of learners investigate the relationship between time and distance travelled by a sound wave.

A learner fired a shot with a starter's gun and another learner started the stopwatch at the same time he saw the smoke and stopped the stopwatch the instant he heard the sound from the starter's gun. The experiment is repeated four times.

The learners' results are plotted on a graph as shown below.



Use information from the graph to:

8.1.1 Determine the time it takes sound to travel 52,5 m (2)

8.1.2 Calculate the gradient of the graph (3)

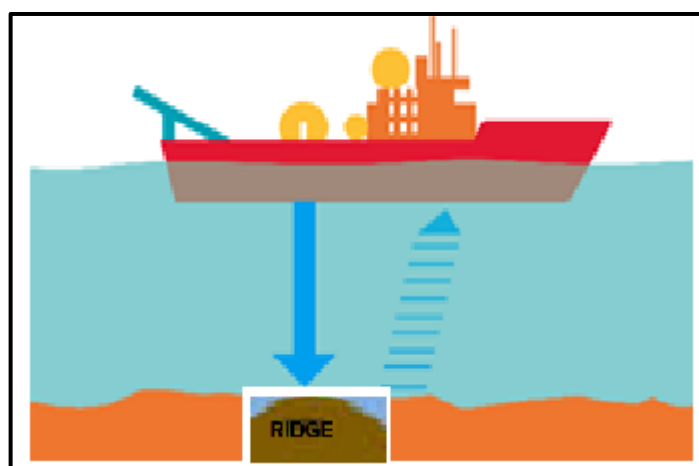
8.2 Write down the:

8.2.1 Name of the quantity the gradient of the graph represents (1)

8.2.2 Relationship (in words) between the distance and time the sound travels (2)

8.3 A sonar is used to locate underwater objects by reflecting waves off underwater objects as shown below.

The sound wave in the diagram below takes 0,45 s for the sonar to register the echo.



How will EACH of the following quantities change when the frequency of the sound source is doubled?

Write only **INCREASES**, **DECREASES** or **REMAINS THE SAME**.

8.3.1 Speed. Explain your answer. (3)

8.3.2 Time it takes the sonar to hear the echo. Explain your answer. (3)

8.4 Write down TWO examples of longitudinal waves that occur naturally. (2)

[16]

**QUESTION 9**

The table below shows the hearing range of various animals.

<b>Animal</b>	<b>Lowest frequency (Hz)</b>	<b>Highest frequency (Hz)</b>
Dogs	40	46 000
Elephants	16	12 000
Dolphins	70	150 000
Humans	20	20 000
Bats	1000	150 000

9.1 Identify THREE animals from the list that can hear ultrasonic sounds. (3)

9.2 Write down the name of:

9.2.1 The low frequency sound that humans cannot hear (1)

9.2.2 The animal that can best detect earthquake waves

Give a reason for your answer. (2)

9.3 Write down:

9.3.1 TWO applications of infrasonic sound (2)

9.3.2 TWO applications of ultrasonic sound (2)

9.4 Calculate the minimum wavelength of sound that can be heard by a dolphin. (3)

**[13]**

**TOTAL: 150**

**DATA FOR TECHNICAL SCIENCES GRADE 11  
PAPER 2**

**GEGEWENS VIR TEGNIESE WETENSKAPPE GRAAD 11  
VRAESTEL 2**

**TABLE 1: SPECIFIC HEAT CAPACITIES/TABEL 1: SPESIFIEKE HITTEKAPASITEITE**

Name	Values (J.kg <sup>-1</sup> .K <sup>-1</sup> )
Water	4 200
Copper	400
Aluminium	900
Glass	700
Ethyl alcohol	2 460
Iron	460
Zinc	380
Lead	130
Ice	2 100
Brass	380
Mercury	140
Methylated spirits	2 400

**TABLE 2: FORMULAE/TABEL 2: FORMULES**

**HEAT AND THERMODYNAMICS/HITTE EN TERMODINAMIKA**

$C = c m$	$Q = c m \Delta T$	$\Delta Q = \Delta U + \Delta W$
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**WAVES, SOUND AND LIGHT/GOLWE, KLANK EN LIG**

$f = \frac{1}{T}$	$\Delta v = \frac{\Delta x}{\Delta t}$
$T = \frac{1}{f}$	$v = f \lambda$

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)	
KEY/ SLEUTEL																		
Atomic number																		
Elektronegatiwiteit Electronegativity																		
Simbool Symbol																		
Benaderde relatiewe atoommassa Approximate relative atomic mass																		
1 2,1 H 1	3 1,0 Li 7	4 1,5 Be 9																2 He 4
11 0,9 Na 23	12 1,2 Mg 24																	10 Ne 20
19 0,8 K 39	20 1,0 Ca 40	21 1,3 Sc 45	22 1,5 Ti 48	23 1,6 V 51	24 1,6 Cr 52	25 1,5 Mn 55	26 1,8 Fe 56	27 1,8 Co 59	28 1,8 Ni 59	29 1,9 Cu 63,5	30 1,6 Zn 65	31 1,6 Ga 70	32 1,8 Ge 73	33 2,0 As 75	34 2,4 Se 79	35 2,8 Br 80	36 Kr 84	
37 0,8 Rb 86	38 1,0 Sr 88	39 1,2 Y 89	40 1,4 Zr 91	41 Nb 92	42 1,8 Mo 96	43 1,9 Tc	44 2,2 Ru 101	45 2,2 Rh 103	46 2,2 Pd 106	47 1,9 Ag 108	48 1,7 Cd 112	49 1,7 In 115	50 1,8 Sn 119	51 1,9 Sb 122	52 2,1 Te 128	53 2,5 I 127	54 Xe 131	
55 0,7 Cs 133	56 0,9 Ba 137	57 La 139	72 1,6 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	81 1,8 Tl 204	82 1,8 Pb 207	83 1,9 Bi 209	84 2,0 Po	85 2,5 At	86 Rn	
87 0,7 Fr	88 0,9 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		

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

Half-reactions/Halfreaksies	$E^{\theta}$ (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
<b><math>2H^+ + 2e^- \rightleftharpoons H_2(g)</math></b>	<b>0,00</b>
$Fe^{3+} + 3e^- \rightleftharpoons Fe$	- 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/Halfreaksies	$E^\theta$ (V)
$\text{Li}^+ + \text{e}^- \rightleftharpoons \text{Li}$	-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
$\text{Mg}^{2+} + 2\text{e}^- \rightleftharpoons \text{Mg}$	-2,36
$\text{Al}^{3+} + 3\text{e}^- \rightleftharpoons \text{Al}$	-1,66
$\text{Mn}^{2+} + 2\text{e}^- \rightleftharpoons \text{Mn}$	-1,18
$\text{Cr}^{2+} + 2\text{e}^- \rightleftharpoons \text{Cr}$	-0,91
$2\text{H}_2\text{O} + 2\text{e}^- \rightleftharpoons \text{H}_2(\text{g}) + 2\text{OH}^-$	-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
$\text{Cr}^{3+} + \text{e}^- \rightleftharpoons \text{Cr}^{2+}$	-0,41
$\text{Cd}^{2+} + 2\text{e}^- \rightleftharpoons \text{Cd}$	-0,40
$\text{Co}^{2+} + 2\text{e}^- \rightleftharpoons \text{Co}$	-0,28
$\text{Ni}^{2+} + 2\text{e}^- \rightleftharpoons \text{Ni}$	-0,27
$\text{Sn}^{2+} + 2\text{e}^- \rightleftharpoons \text{Sn}$	-0,14
$\text{Pb}^{2+} + 2\text{e}^- \rightleftharpoons \text{Pb}$	-0,13
$\text{Fe}^{3+} + 3\text{e}^- \rightleftharpoons \text{Fe}$	-0,06
$2\text{H}^+ + 2\text{e}^- \rightleftharpoons \text{H}_2(\text{g})$	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
$\text{Cu}^{2+} + \text{e}^- \rightleftharpoons \text{Cu}^+$	+0,16
$\text{SO}_4^{2-} + 4\text{H}^+ + 2\text{e}^- \rightleftharpoons \text{SO}_2(\text{g}) + 2\text{H}_2\text{O}$	+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
$\text{Cu}^+ + \text{e}^- \rightleftharpoons \text{Cu}$	+0,52
$\text{I}_2 + 2\text{e}^- \rightleftharpoons 2\text{I}^-$	+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
$\text{NO}_3^- + 2\text{H}^+ + \text{e}^- \rightleftharpoons \text{NO}_2(\text{g}) + \text{H}_2\text{O}$	+0,80
$\text{Ag}^+ + \text{e}^- \rightleftharpoons \text{Ag}$	+0,80
$\text{Hg}^{2+} + 2\text{e}^- \rightleftharpoons \text{Hg}(\text{l})$	+0,85
$\text{NO}_3^- + 4\text{H}^+ + 3\text{e}^- \rightleftharpoons \text{NO}(\text{g}) + 2\text{H}_2\text{O}$	+0,96
$\text{Br}_2(\text{l}) + 2\text{e}^- \rightleftharpoons 2\text{Br}^-$	+1,07
$\text{Pt}^{2+} + 2\text{e}^- \rightleftharpoons \text{Pt}$	+1,20
$\text{MnO}_2 + 4\text{H}^+ + 2\text{e}^- \rightleftharpoons \text{Mn}^{2+} + 2\text{H}_2\text{O}$	+1,23
$\text{O}_2(\text{g}) + 4\text{H}^+ + 4\text{e}^- \rightleftharpoons 2\text{H}_2\text{O}$	+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
$\text{MnO}_4^- + 8\text{H}^+ + 5\text{e}^- \rightleftharpoons \text{Mn}^{2+} + 4\text{H}_2\text{O}$	+1,51
$\text{H}_2\text{O}_2 + 2\text{H}^+ + 2\text{e}^- \rightleftharpoons 2\text{H}_2\text{O}$	+1,77
$\text{Co}^{3+} + \text{e}^- \rightleftharpoons \text{Co}^{2+}$	+1,81
$\text{F}_2(\text{g}) + 2\text{e}^- \rightleftharpoons 2\text{F}^-$	+2,87

Increasing oxidising ability/Toenemende oksiderende vermoë

Increasing reducing ability/Toenemende reduserende vermoë