DEPARTMENT OF EDUCATION

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PROVINCIAL PREPARATORY EXAMINATION

GRADE 12

PHYSICAL SCIENCES P2: CHEMISTRY

SEPTEMBER 2019

MARKS: 150
TIME: 3 hours

This question paper consists of 17 pages and 4 data sheets.

INTRUCTIONS AND INFORMATION

1. This question paper consists of TEN questions. Answer ALL the questions in the ANSWER BOOK.

2. Start EACH question on a NEW page in the ANSWER BOOK.

3. Number the answers correctly according to the numbering system used in this question paper.

4. Leave ONE line between two sub questions, for example between QUESTION 2.1 and QUESTION 2.2.

5. You may use a non-programmable calculator.

6. You may use appropriate mathematical instruments.

7. You are advised to use the attached DATA SHEETS.

8. Show ALL formulae and substitutions in ALL calculations.

9. Round off your final numerical answers to a minimum of TWO decimal places.

10. Give brief motivations, discussions, etc. where required.

11. Write neatly and legibly.

QUESTION 1: MULTIPLE-CHOICE QUESTIONS

Various possible options are provided as 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, for example 1.11 E.

1.1 The group of atoms which determine the chemical properties of carboxylic acids is called the ...

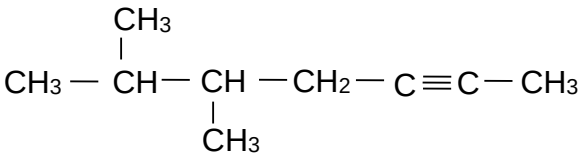
A formyl group.

B carbonyl group.

C carboxyl group.

D hydroxyl group. (2)

1.2 Consider the condensed structural formula of an organic compound below.



The IUPAC name of this compound is …

A 2,3-dimethylhept-5-yne.

B 5,6-dimethylhept-2-yne.

C 2,3-methylhept-2-yne.

D 5,6-dimethylhept-3-yne. (2)

1.3 Which ONE of the following compounds, of comparable molecular mass, has the highest vapour pressure?

A Pentane

B Butan-2-one

C Propanoic acid

D Ethyl methanoate (2)

1.4 The heat of reaction (ΔH) and the activation energy (E_a) for a reaction are -111 kJ·mol^{-1} and 43 kJ·mol^{-1} respectively. The activation energy for the reverse reaction will be ...

A -43 kJ·mol^{-1}

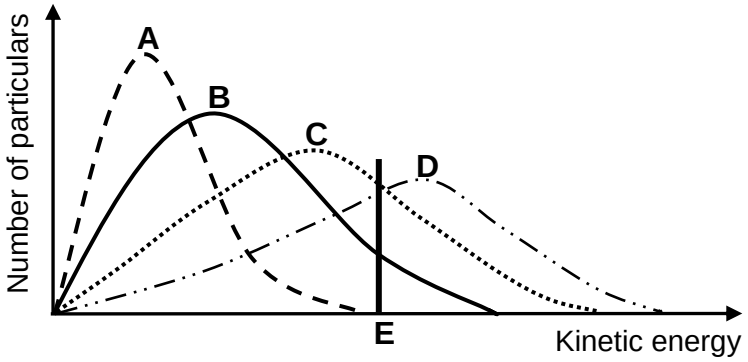
B 111 kJ·mol^{-1}

C 154 kJ·mol^{-1}

D 68 kJ·mol^{-1} (2)

1.5 The Maxwell-Boltzmann energy distribution curves (**A, B, C** and **D**) below show the number of particles versus kinetic energy for a reaction at four different temperatures. The minimum kinetic energy needed for effective collisions to take place is represented by **E.**

Which ONE of the curves (**A, B, C** or **D**) represents the reaction that will take place the fastest? (2)



1.6 The expression for the equilibrium constant (K_C) of a hypothetical reaction is given as follows:

$$K_C = \frac{[D]^2[C]}{[A]^3}$$

Which ONE of the following equations represents this reaction?

A $3A(s) \rightleftharpoons C(g) + 2D(g)$

B $3A(\ell) \rightleftharpoons C(aq) + 2D(aq)$

C $3A(aq) + B(s) \rightleftharpoons C(g) + D_2(g)$

D $3A(aq) + B(s) \rightleftharpoons C(aq) + 2D(aq)$ (2)

1.7 Which ONE of the following indicators is most suitable for the titration of ethanoic acid with sodium hydroxide?

Indicator	pH
A	0,2 - 1,8
B	2,9 - 4,0
C	6,0 - 7,6
D	11,6 - 14,0

(2)

1.8 The electrode where oxidation occurs in all electrochemical cells is the ...

A anode.

B cathode.

C positive electrode.

D negative electrode. (2)

1.9 During the electrolysis of a concentrated sodium chloride solution, the hydrogen gas is formed as a result of ...

A reduction of hydrogen ions.

B oxidation of hydrogen ions.

C reduction of water.

D oxidation of water. (2)

1.10 Which ONE of the following nutrients is primarily responsible for the growth of leaves in a plant?

A Carbon

B Nitrogen

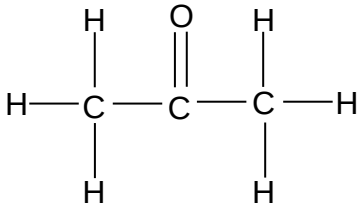
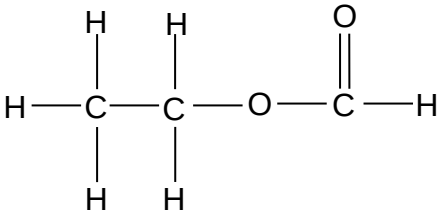
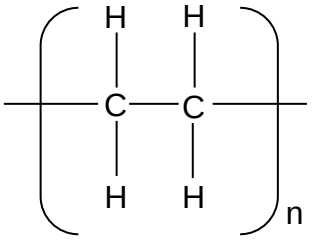
C Potassium

D Phosphorous (2)

[20]

QUESTION 2 (Start on a new page.)

The letters **A** to **H** in the table below are used to represent eight organic compounds.

A	Propanoic acid	**B**	
C		**D**	But-2-ene
E	1,2-dichloro-3-methylbutane	**F**	$CH_3CH_2COOCH_2CH_3$
G	$CH_3CCCH(C_2H_5)CH_2CH_3$	**H**	

2.1 Write down the letter(s) that represent(s):

2.1.1 An alkyl halide (1)

2.1.2 Two compounds that are functional isomers (1)

2.2 Write down the IUPAC name of:

2.2.1 Compound **B** (2)

2.2.2 Compound **F** (2)

2.2.3 The organic acid used in the preparation of compound **C** (1)

2.3 Write down the structural formula of compound **G**. (3)

2.4 Compound **H** is a polymer. For this polymer write down:

2.4.1 The structural formula of the monomer used in its preparation (1)

2.4.2 The type of polymerisation reaction taking place during its preparation (1)

2.5 1 mole of C_nH_{2n} burns completely in 192 g oxygen according to the following UNBALANCED equation:

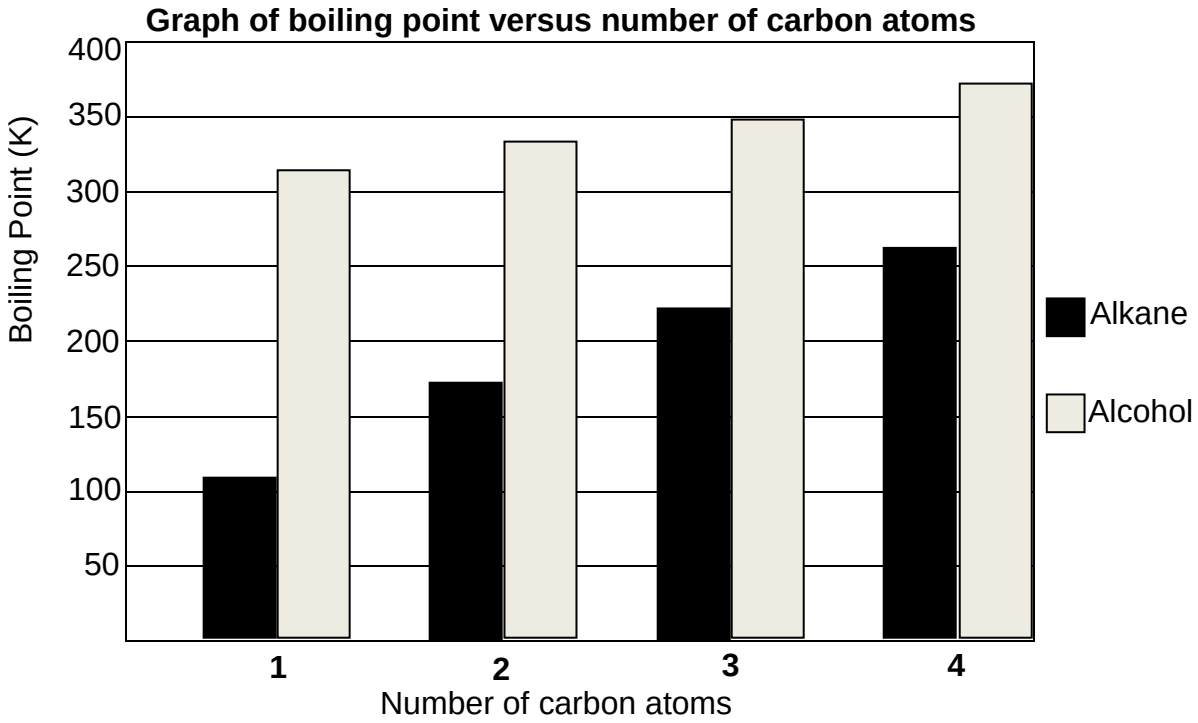
$$C_nH_{2n} + O_2 \rightarrow CO_2 + H_2O$$

Balance the given equation and determine the molecular formula of C_nH_{2n} with the aid of a calculation. (5)

[17]

QUESTION 3 (Start on a new page.)

The graph below shows the results obtained when investigating the relationship between boiling points of straight chain alkanes and alcohols and the number of carbon atoms per molecule.



3.1 What trend in boiling point is observed for the alkanes? (2)

3.2 Both butane and butan-1-ol contain four carbon atoms per molecule.

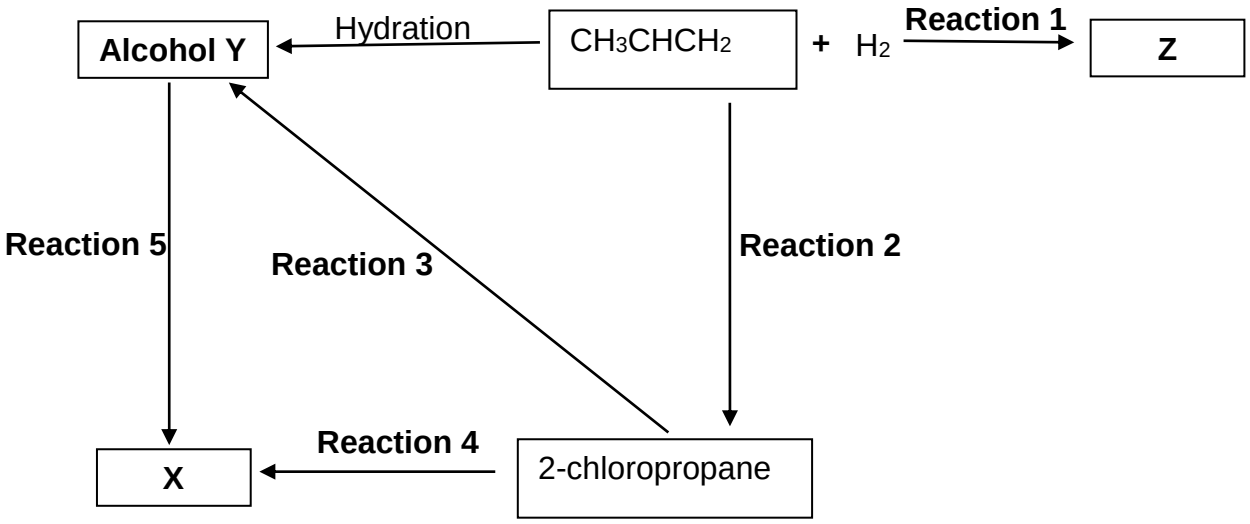
3.2.1 How does the boiling point of butan-1-ol compare to that of butane as shown in the graph? Write down only HIGHER THAN, LOWER THAN or EQUAL TO. (1)

3.2.2 Write down the names of TWO intermolecular forces which exist between butan-1-ol molecules. (2)

3.2.3 By refering to the different types of intermolecular forces, briefly explain the difference in boiling points of butane and butan-1-ol. (3)
[8]

QUESTION 4 (Start on a new page.)

Study the flow diagram below, which represents various organic reactions, and answer the questions that follow.



4.1 **Reaction 1** is an example of an addition reaction. For **Reaction 1** write down:

4.1.1 The type of addition reaction (1)

4.1.2 The NAME or FORMULA of a suitable catalyst (1)

4.2 Write down the structural formula and IUPAC name of compound **Y.** (3)

4.3 Is alcohol **Y** a PRIMARY, SECONDARY or TERTIARY alcohol? Give a reason for your answer. (2)

4.4 **Reaction 5** is an elimination reaction. For **Reaction 5** write down:

4.4.1 ONE reaction condition required (1)

4.4.2 The IUPAC name of compound **X** (1)

4.5 Using STRUCTURAL FORMULAE for the organic compounds involved, write down a balanced equation for **Reaction 4.** (5)

4.6 Both **Reactions 3** and **4** take place in the presence of an inorganic reagent.

4.6.1 Name the type of reaction represented by **Reaction 3**. (1)

4.6.2 Write down the TWO reaction conditions which would favour **Reaction 3** instead of **Reaction 4.** (2)

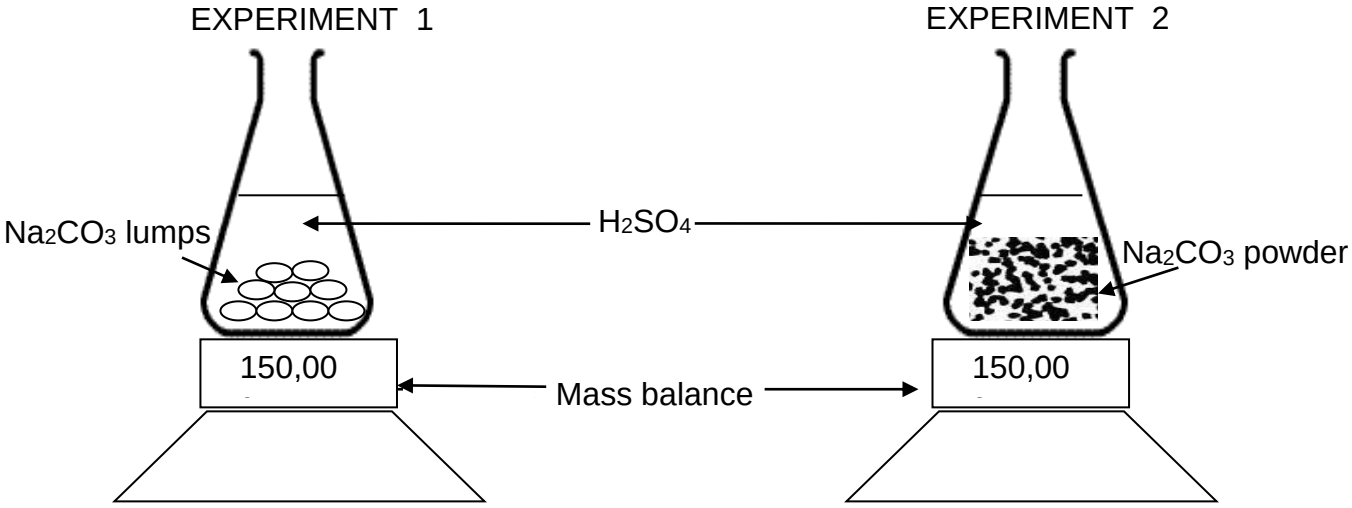
[17]

QUESTION 5 (Start on a new page.)

The reaction between sodium carbonate (Na_2CO_3) and sulphuric acid (H_2SO_4) was used to investigate one of the factors affecting reaction rate. The balanced equation is given below.

$$Na_2CO_3(s) + H_2SO_4(aq) \rightarrow Na_2SO_4(aq) + CO_2(g) + H_2O(\ell)$$

Two experiment are conducted as illustrated below.



In both experiments the same amount of sodium carbonate is added to an excess of sulphuric acid solution in a conical flask placed on a mass balance. The mass of the flask together with its contents is recorded every 15 s.

5.1 Define the term *reaction rate*. (2)

5.2 For the investigation described above, write down:

5.2.1 The independent variable (1)

5.2.2 ONE controlled variable (1)

The results obtained in EXPERIMENT 1 are shown in the table below.

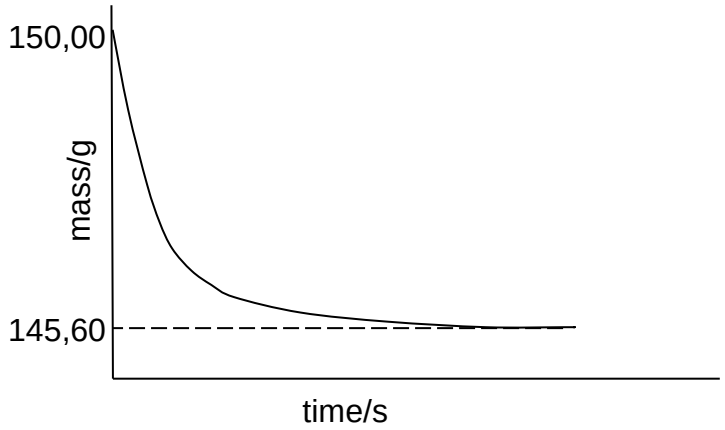
Time (s)	0	15	30	45	60	75	90	105	120
Mass (g)	150,00	147,50	146,60	146,00	145,80	145,70	145,60	145,60	145,60

5.3 Write down the NAME or FORMULA of the substance responsible for the decrease in mass. (1)

5.4 How long does it take for the reaction in EXPERIMENT 1 to be completed? (1)

5.5 How will the rate of the reaction in EXPERIMENT 2 compare to that in EXPERIMENT 1? Write down GREATER THAN, SMALLER THAN or EQUAL TO. Briefly explain your answer by referring to the collision theory. (3)

5.6 The sketch graph below **(not drawn to scale)** represents the results obtained for EXPERIMENT 1.



5.6.1 Use the information in the graph to determine the mass of sodium carbonate that has reacted in EXPERIMENT 1. (5)

5.6.2 Redraw the above sketch graph in your ANSWER BOOK. On the same set of axes, sketch the curve obtained for EXPERIMENT 2. **Label your graph as Exp.2**. (2)

[16]

QUESTION 6 (Start on a new page.)

The following balanced equation represents the production of methanol (CH_3OH) using carbon monoxide gas (CO) and hydrogen gas (H_2).

$$CO(g) + 2H_2(g) \rightleftharpoons CH_3OH(g) \qquad \Delta H = +128,49\ kJ{\cdot}mol^{-1}$$

The reaction reaches equilibrium at 380 K.

6.1 Define the term *dynamic equilibrium*. (2)

6.2 An unknown mass of carbon monoxide gas (CO) is injected into a 2 dm^3 closed vessel, containing 1,5 moles of hydrogen gas (H_2). Upon reaching equilibrium at 380 K, 0,75 moles of hydrogen gas (H_2) remains in the vessel. If the equilibrium constant, (K_c), for this reaction is 6,27 at 380 K, calculate the initial mass of carbon monoxide gas (CO) injected into the vessel. (9)

6.3 For the given equilibrium reaction, write down the K_c value for the reverse reaction at 380 K. (2)

6.4 The same amounts of CO(g) and H_2(g) as before are now heated in a LARGER VESSEL and the reaction reaches equilibrium at 380 K. How will each of the following be affected by this change? Write down INCREASES, DECREASES or REMAINS THE SAME. Explain your answer.

6.4.1 The K_c value (2)

6.4.2 The equilibruim yield of methanol (CH_3OH) (2)

6.5 The temperature is now decreased to 300 K and a new equilibrium is established. How will the amount of methanol (CH_3OH) formed at 300 K compare to that formed at 380 K? Write down INCREASES, DECREASES or REMAINS THE SAME. Explain your answer using Le Chatelier's principle. (3)

[20]

QUESTION 7 (Start on a new page.)

7.1 Define an *acid* according to the Brønsted-Lowry theory. (2)

7.2 Calculate the pH of a sodium hydroxide solution of concentration 0,75 mol·dm^{-3}. (5)

7.3 Seashells contain calcium carbonate ($CaCO_3$). In a test to find the percentage of calcium carbonate ($CaCO_3$) present in seashells, 75 cm^3 of a 0,5 mol·dm^{-3} hydrochloric acid ($HC\ell$) solution is added to a 5 g sample of seashells.The acid is in excess. The balanced equation for the reaction is given below.

$$CaCO_3(s) + 2HC\ell(aq) \rightarrow CaC\ell_2(aq) + CO_2(g) + H_2O(\ell)$$

The excess acid required 22 cm^3 of the above sodium hydroxide solution for complete neutralisation according to the following balanced equation:

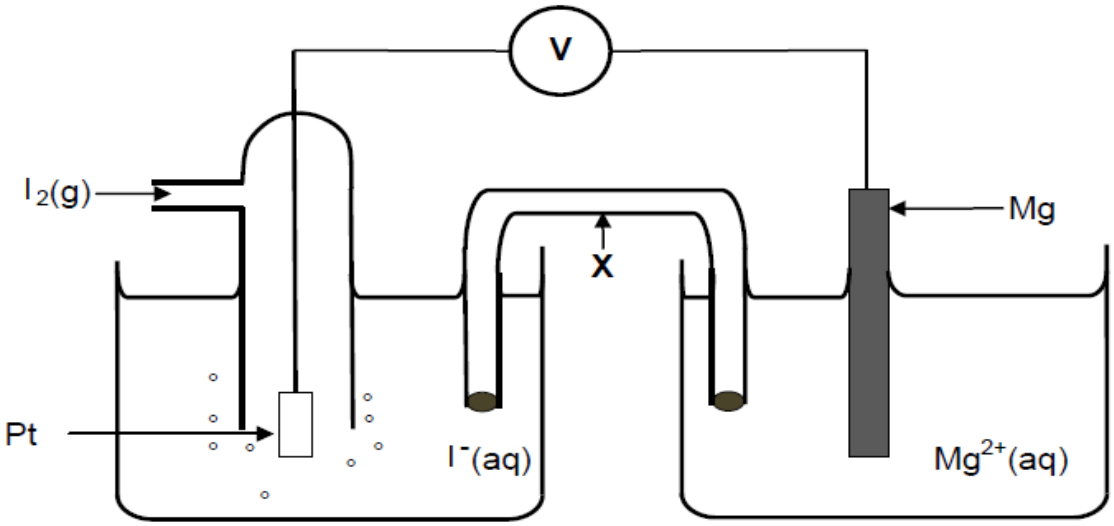
$$HC\ell(aq) + NaOH(aq) \rightarrow NaC\ell(aq) + H_2O(\ell)$$

Calculate the percentage of calcium carbonate ($CaCO_3$) in the sample of seashells. (8)

[15]

QUESTION 8 (Start on a new page.)

A galvanic cell is set up using a magnesium half-cell and an iodine half-cell as shown in the diagram below.



8.1 Write down the name of the component labelled **X**. (1)

8.2 Name the standard reference electrode against which all other electrode potentials are measured. (1)

8.3 The I_2 **|** I^- half-cell requires platinum when the galvanic cell is operating. What is the function of the platinum? (1)

8.4 Write down the cell notation for the above cell. (3)

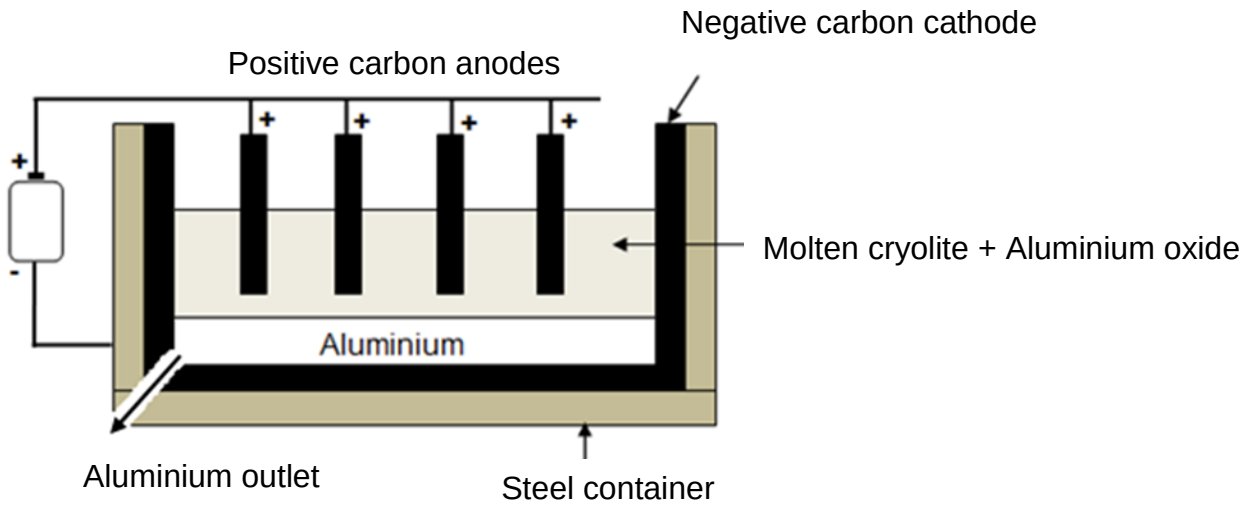
8.5 The voltmeter is now replaced with a 3 V bulb. Will the bulb glow to its maximum brightness? Support your answer with a suitable calculation. (5)

8.6 The cell reactions in the above galvanic cell reaches equilibrium. How will this affect the glowing of the above bulb? Give a reason for your answer. (2)

[13]

QUESTION 9 (Start on a new page.)

Aluminium is extracted by electrolysis as illustrated in the simplified diagram below.



9.1 Write down the energy conversion that takes place in the above cell. (1)

9.2 Write down an equation for the half-reaction that occurs at the anode. (2)

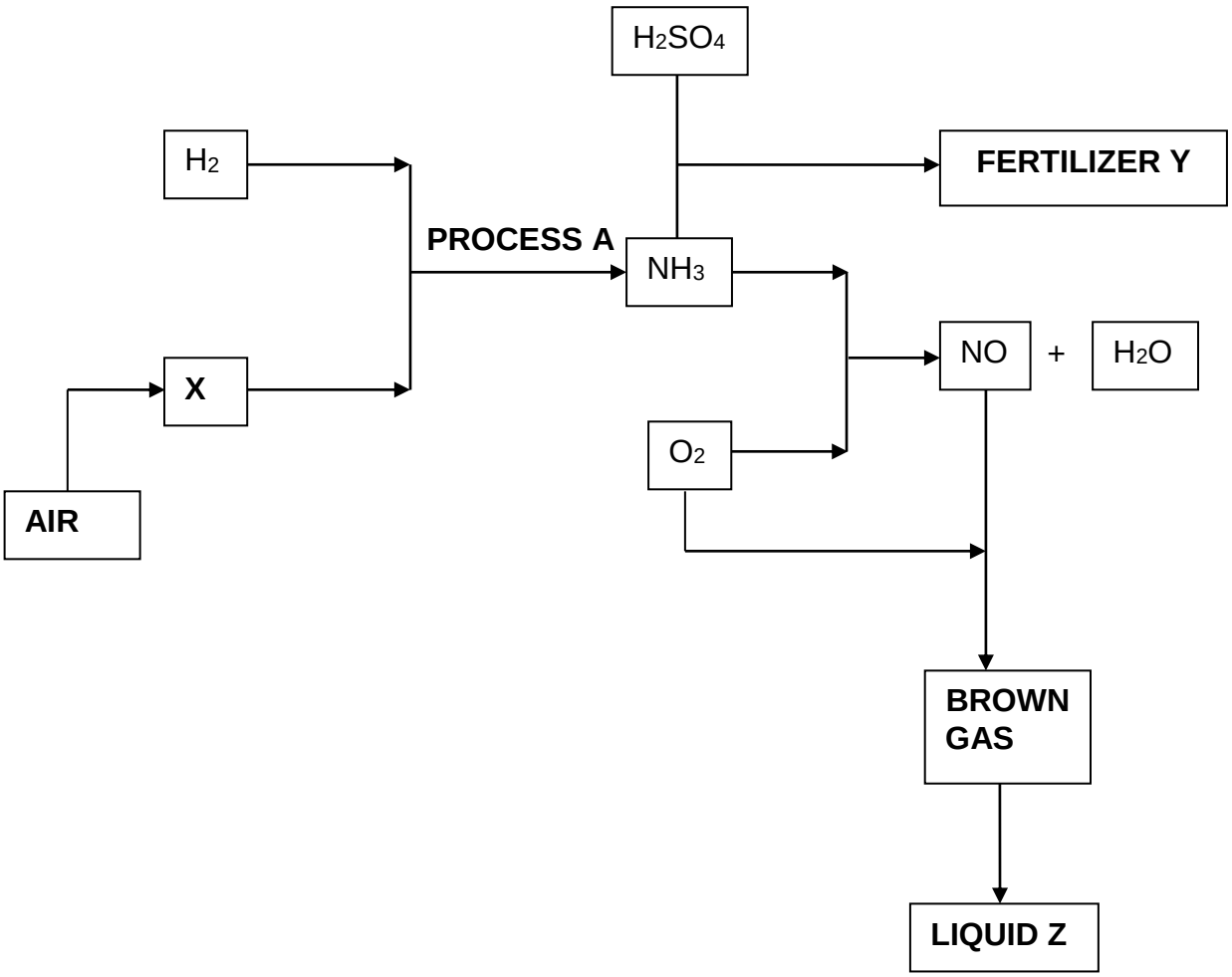
9.3 Give a reason why the anodes must be replaced frequently. (2)

9.4 Before the extraction process, aluminium oxide is heated with cryolite. Give a reason why cryolite is added to the aluminium oxide. (1)

9.5 Write down TWO negative impacts of the extraction of aluminium on the environment. (2)
[8]

QUESTION 10 (Start on a new page.)

The following flow diagram illustrates some of the processes in the manufacture of fertilisers.



10.1 Identify the following in the flow diagram:

10.1.1 Name of substance **X** (1)

10.1.2 Process **A** (1)

10.1.3 Fertilizer **Y** (1)

10.1.4 The brown gas (1)

10.2 Write down the balanced equation for the formation of liquid **Z**. (3)

10.3 A farmer wishes to buy a fertilizer which will ensure a good maize harvest. He chooses a 50 kg bag of fertiliser with the following numbers written on the label: 7:2:1(**X**).

10.3.1 Determine the value of **X**, if the bag contains 1,2 kg of potassium. (4)

10.3.2 Will this fertilizer lead to a good crop yield? Briefly explain your answer. (3)

10.4 The excessive use of fertilizers can lead to eutrophication. Write down TWO possible ways farmers can reduce eutrophication. (2)

[16]

GRAND TOTAL: 150

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 x 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 x 10^{-19} C
Avogadro's constant *Avogadro-konstante*	N_A	6,02 x 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 x 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* $E^{\theta}_{cell} = E^{\theta}_{oxidisingagent} - E^{\theta}_{reducingagent}$ / $E^{\theta}_{sel} = E^{\theta}_{oksideermiddel} - E^{\theta}_{reduseermiddel}$	

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

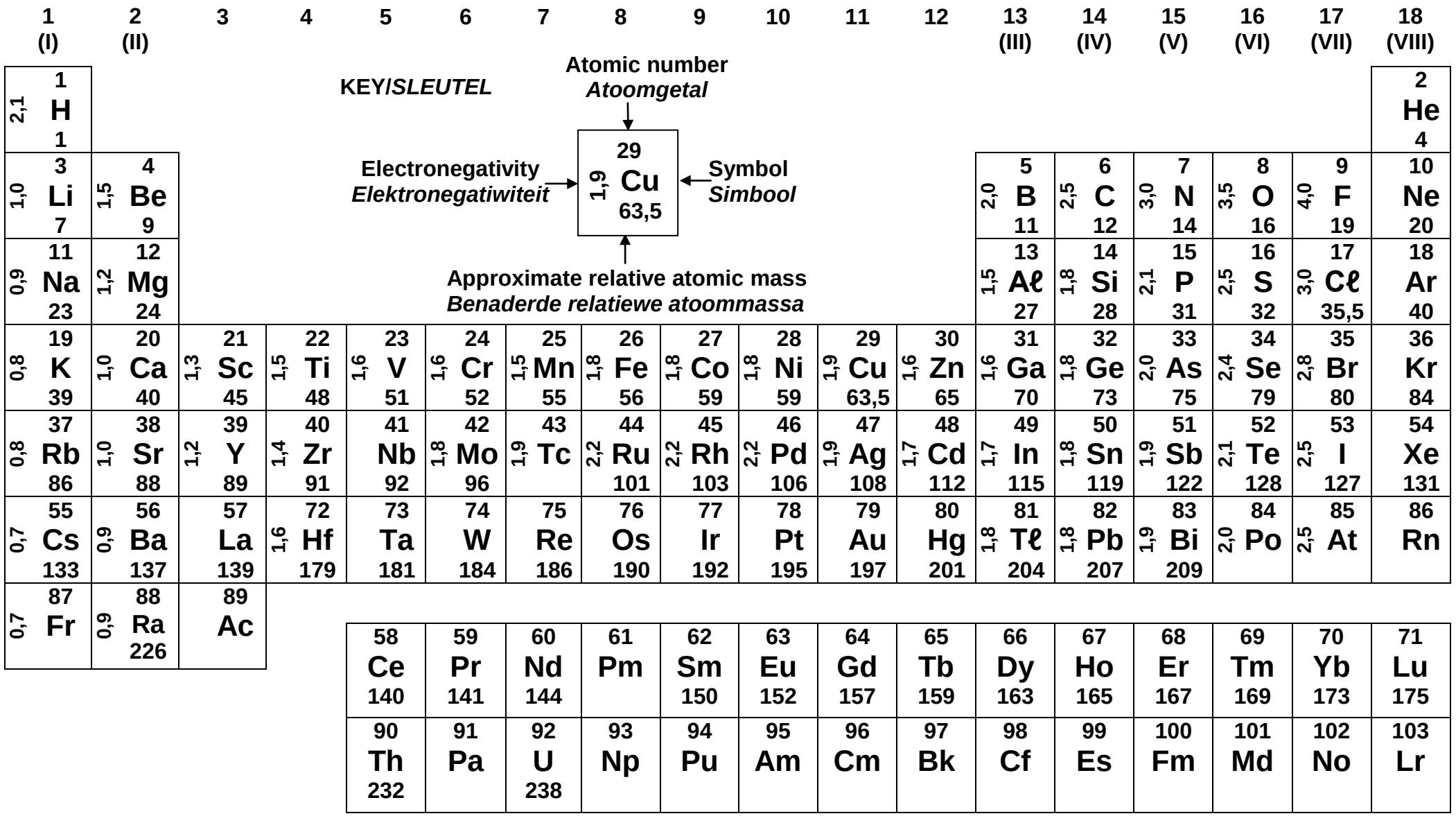


TABLE 4A: STANDARD REDUCTION POTENTIALS
TABEL 4A: STANDAARD-REDUKSIEPOTENSIALE

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

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
$Mg^{2+} + 2e^- \rightleftharpoons Mg$	– 2,36
$A\ell^{3+} + 3e^- \rightleftharpoons A\ell$	– 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 reducing ability/*Toenemende reduserende vermoë* ↑