education

Department:
Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATION - 2006

PHYSICAL SCIENCE P2
CHEMISTRY

STANDARD GRADE

OCTOBER/NOVEMBER 2006

MARKS: 150

TIME: 2 hours

This question paper consists of 13 pages, a data sheet of 4 pages and 1 multiple-choice answer sheet.

GENERAL INSTRUCTIONS

1. Answer ALL questions.
2. Non-programmable calculators may be used.
3. Appropriate mathematical instruments may be used.
4. A Data Sheet is provided for your use.

QUESTION 1

INSTRUCTIONS

1. Answer this question on the specially printed ANSWER SHEET. (Write your EXAMINATION NUMBER in the appropriate space.) *[Note: This instruction may vary, depending on the type of answer book used by the province.]*

2. Use a PENCIL when making the necessary cross on your answer sheet.

3. In the case of a wrong answer, erase the pencil marks completely.

4. Do not make any other marks on your answer sheet. Any calculations or writing that may be necessary when answering this question should be done in the answer book and must be clearly deleted by means of a diagonal line drawn across the page.

   PLACE THE COMPLETED ANSWER SHEET INSIDE THE FRONT COVER OF YOUR ANSWER BOOK. *[Note: This instruction may vary, depending on the type of answer book used by the province.]*

5. Four possible answers, indicated by A, B, C and D, are supplied with each question. Choose only that answer, which in your opinion, is the correct or best one and mark the appropriate block on your answer sheet.

6. Each question has only one correct answer.

7. If more than one block is marked, no marks will be awarded for that answer.

EXAMPLE

QUESTION: The symbol for the unit of time is ...

A t.
B h.
C s.
D m.

ANSWER:

A	**B**	[✓ **C**]	**D**

1.1 Which ONE of the following factors should be kept constant when verifying Boyle's law?

A Density
B Volume
C Pressure
D Temperature (3)

1.2 The intermolecular forces between the particles of iodine crystals (I_2(s)) can best be classified as ...

A Van der Waals forces.
B hydrogen bonds.
C ion-dipole forces.
D ionic-bond forces. (3)

1.3 Manganese(IV) oxide (MnO_2) is used in the laboratory preparation of chlorine gas. In the reaction MnO_2 acts as ...

A a catalyst.
B an oxidising agent.
C a dehydrating agent.
D a bleaching agent. (3)

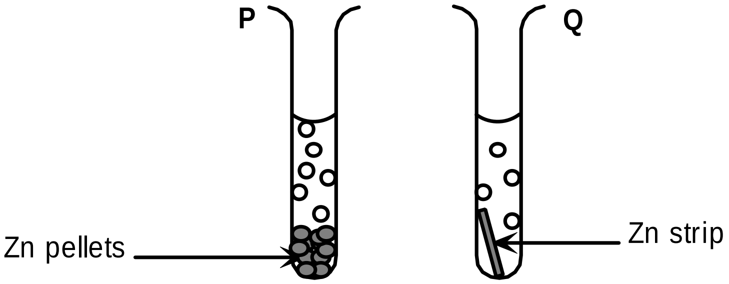
1.4 In industry nitrogen is obtained through the ...

A Ostwald process.
B electrolysis of sodium nitrate.
C liquefaction and fractional distillation of air.
D liquefaction and fractional distillation of atmospheric moisture. (3)

1.5 In the reaction of sulphur dioxide gas with water, ...

A the water is reduced.
B sulphurous acid is formed.
C sulphur is formed.
D the sulphur dioxide is oxidised. (3)

1.6 Two learners put 5 g Zn pellets in test tube **P** and a 5 g Zn strip in test tube **Q** respectively. (See diagram.) They now simultaneously add 20 cm^3 of a 1 $mol.dm^{-3}$ HCℓ solution at 25 ºC into each test tube.



The difference in the rate at which hydrogen is produced in test tubes P and Q is due to the …

A mass of the Zn metal used.

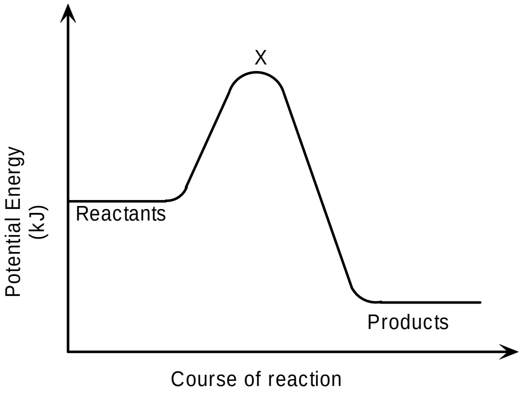
B size of the Zn metal used.

C temperature of the HCℓ solution.

D concentration of the HCℓ used. (3)

1.7 Consider the potential-energy diagram below for the following reaction:

$$Zn(s) + 2HCℓ(aq) \rightarrow ZnCℓ_2(aq) + H_2(g)$$



Which ONE of the statements below is CORRECT?

A The reaction is endothermic.

B Heating the zinc will decrease the heat of reaction (ΔH).

C The activation energy of the reaction can be lowered by using a higher concentration of HCℓ.

D The activated complex will form at position X on the graph. (3)

1.8 An 'ice-pack', containing ammonium chloride ($NH_4C\ell$) and water, is used in hospitals to relieve swelling caused by some accidents. The ice pack cools the affected area.

The ice pack cools down because of a/(n) … reaction.

A endothermic
B neutralisation
C exothermic
D redox (3)

1. 9 Consider the half-reactions below:

$$O_2(g) + 2H^+(aq) + 2e^- \rightarrow H_2O_2(aq)$$

$$SO_4^{2-}(aq) + 4H^+(aq) + 2e^- \rightarrow SO_2(aq) + 2H_2O$$

$$Pb^{2+}(aq) + 2e^- \rightarrow Pb(s)$$

$$Fe^{2+}(aq) + 2e^- \rightarrow Fe(s)$$

The strongest oxidising agent is …
(Use the Table of Standard Reduction Potentials.)

A O_2
B SO_4^2
C Pb^{2+}
D Fe^{2+} (3)

1.10 Consider the equation:

$$NH_3(aq) + H_2O(\ell) \rightleftharpoons NH_4^+(aq) + OH^-(aq)$$

The acids in the reaction are ...

A NH_3 and H_2O
B H_2O and NH_4^+
C NH_3 and OH^-
D NH_4^+ and OH^- (3)

1.11 A learner spilled some sulphuric acid on the floor. She wanted to add a substance which would neutralise the acid without itself doing further damage. Which ONE of the following substances would be the most suitable?

	Substance	**pH**
A	Vinegar	4
B	Lemon juice	5
C	Sodium bicarbonate	8
D	Sodium hydroxide	13

(3)

1.12 The net reaction occuring in a standard Zn-Cu electrochemical cell is ...

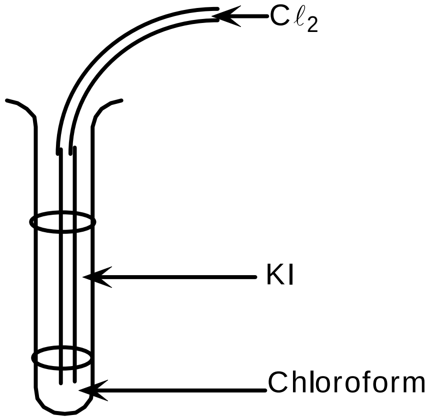
A $Cu^{2+}(aq) + Zn(s) \rightarrow Zn^{2+}(aq) + Cu(s)$

B $Zn^{2+}(aq) + Cu^{2+}(aq) \rightarrow Zn(s) + Cu(s)$

C $Zn(s) + Cu(s) \rightarrow Zn^{2+}(aq) + Cu^{2+}(aq)$

D $Cu(s) + Zn^{2+}(aq) \rightarrow Cu^{2+}(aq) + Zn(s)$ (3)

1.13 Chloroform is added to a colourless solution of potassium iodide (KI) in a test tube and then chlorine gas ($C\ell_2$) is bubbled through the solution. The chloroform layer in the test tube turns purple. Which ONE of the following statements is CORRECT?



A The chloroform oxidizes the iodide ions.

B The $C\ell_2$ is a reducing agent.

C The iodide ions form a purple complex with chloroform.

D The formed iodine (I_2) is more soluble in chloroform than in water. (3)

1.14 Which ONE of the following formulae represents an alkane?

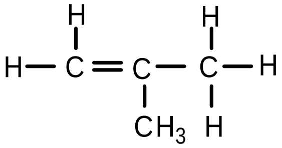
A C_2H_2

B C_3H_4

C C_3H_6

D C_3H_8 (3)

1.15 An organic compound has the structural formula shown below:



The correct systematic (IUPAC) name for the compound is …

A but-1-ene.

B but-2-ene.

C methylpropene.

D methylpropane. (3)

[45]

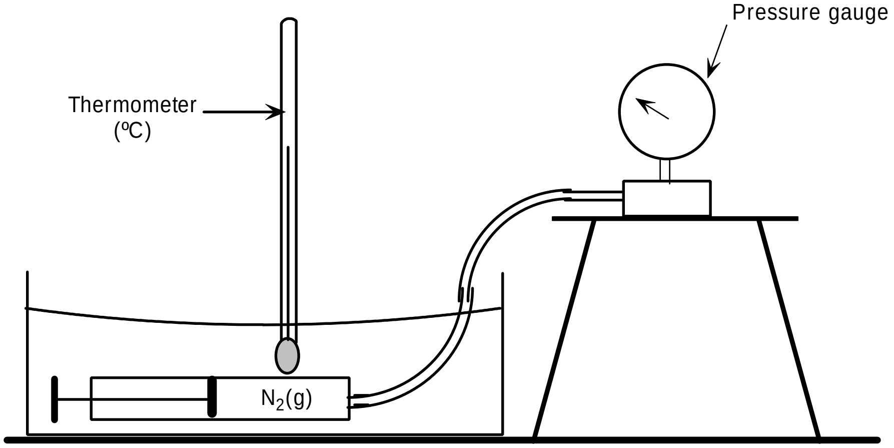
ANSWER QUESTIONS 2 - 9 IN YOUR ANSWER BOOK.

INSTRUCTIONS

1. Start each question on a new page in your answer book.
2. Leave one line between sub-sections, for example between QUESTIONS 2.1 and 2.2.
3. Give all formulae used and show all your workings (this includes substitutions).
4. Number your answers in the same way as the questions are numbered.

QUESTION 2 (Start on a new page)

2.1 A fixed mass of pure nitrogen gas ($N_2(g)$) is trapped in a gas syringe. The syringe is connected to a pressure gauge which measures the gas pressure. The syringe is then placed in a water bath as shown in the diagram. After a few minutes the temperature of the gas, its volume and pressure are measured. The experiment is repeated with different volumes of gas.



The results are tabulated as follows:

	Volume (cm^3)	Temperature (ºC)	Pressure (kPa)
1	40	11,9	96
2	32	12,1	120
3	24	12,1	156

Use the table to answer the following questions:

2.1.1 ONE of the pressure readings is incorrect. Perform calculations to determine the incorrect reading. (6)

2.1.2 Calculate the correct pressure value for the incorrect reading in QUESTION 2.1.1. (2)

2.1.3 This experiment is repeated at a temperature of 25 ºC. How will the value of **pV** for the enclosed gas change? Answer only: INCREASES or DECREASES or STAYS THE SAME. (2)

2.2 Your science teacher instructed you to prepare a 0,1 mol.dm^{-3} standard solution of silver nitrate ($AgNO_3$).

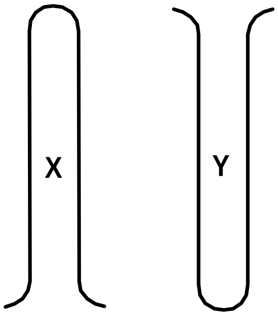
2.2.1 What is meant by the term **standard solution**? (2)

2.2.2 Calculate the mass of $AgNO_3$ crystals required to prepare 100 cm^3 of a solution with a concentration of 0,1 mol.dm^{-3}. (4)

[16]

QUESTION 3 (Start on a new page)

3.1 Two test tubes **X** and **Y** are each filled with a different gas and then clamped in the positions as shown in the diagram. Tests are then performed to identify the gas in each tube.



3.1.1 How does the density of the gas in **X** compare with that in **Y**? (2)

*When concentrated hydrochloric acid is brought near the mouth of test tube **X** white fumes are observed*.

3.1.2 Write down the name of the gas in **X**. (2)

3.1.3 Write down the formula for the white fumes. (2)

*Sulphur dioxide ($SO_2(g)$) is added to the gas in **Y** by means of a gas syringe and the test tube is closed off with a stopper. A yellow precipitate forms in the test tube.*

3.1.4 Write down the formula for the gas that was originally in test tube **Y.** (2)

3.1.5 Write down the oxidation half-reaction for the reaction in test tube Y by making use of the Table of Standard Reduction Potentials. (2)

3.2 Hydrogen chloride gas is prepared in the laboratory.

3.2.1 Write down a balanced equation for the preparation of hydrogen chloride. (3)

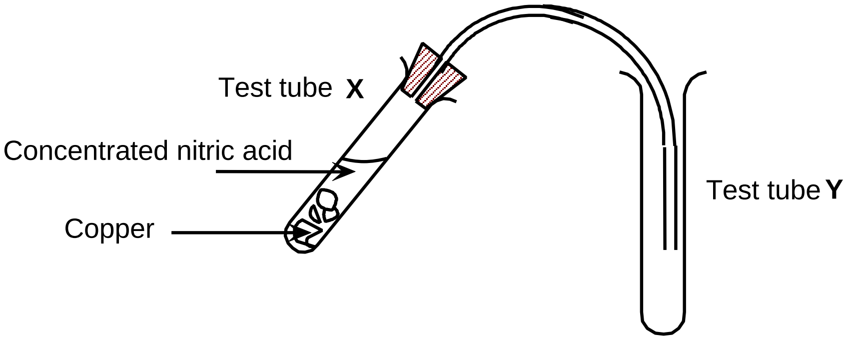
3.2.2 Write down ONE reason why the gas is collected by upward displacement of air. (2)

3.2.3 $HC\ell$ gas is bubbled through water. Write down a balanced equation to show the reaction that occurs in water. (3)

[18]

QUESTION 4 (Start on a new page)

Two learners investigate the reaction between copper turnings and concentrated nitric acid using the apparatus shown below.



4.1 What will they observe in test tube **Y**? (2)

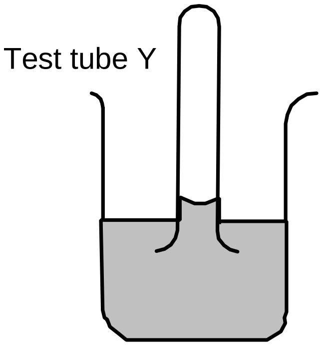
4.2 Write down the colour of the solution in test tube **X** after the reaction has taken place. (2)

4.3 Write down the formula of the ion that is responsible for the colour of the solution. (2)

4.4 Write down the formula of the oxidising agent in this reaction. (2)

The learners place the mouth of test tube Y below the surface of the cold water in a beaker, as indicated in the diagram.

They observe that the water moves slightly upwards into the test tube.



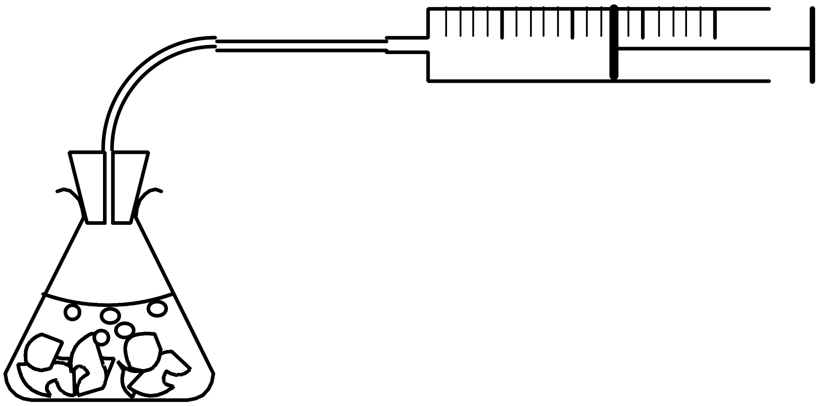
4.5 Why does the water rise in the test tube? (2)

4.6 Is the solution in the beaker now neutral, acidic or basic? (1)

[11]

QUESTION 5 (Start on a new page)

A few marble chips ($CaCO_3$) were placed in a conical flask. The chips were covered with a 2 mol.dm^{-3} solution of HCℓ at 20 °C. The volume of the gas produced was measured using a graduated gas syringe at 30 second intervals.



The results were recorded in the table below.

Time (s)	0	30	60	90	120	150	180
Volume (cm^3)	0	60	150	210	224	224	224

5.1 Write down a balanced equation for the reaction between calcium carbonate and hydrochloric acid. (3)

5.2 During which ONE of the following time intervals was the reaction the quickest? (Choose from: *0 - 30 seconds; 30 - 60 seconds, 60 - 90 seconds, 90 - 120 seconds.*) (2)

5.3 At what time did the reaction reach completion? (2)

5.4 What is the maximum volume of the gas that was delivered? (2)

5.5 This experiment is repeated using the same concentration and volume of acid but at 30 °C. Predict what will happen to the following:
(Choose from: INCREASES, DECREASES or STAYS THE SAME.)

5.5.1 The rate at which CO_2 is produced (2)

5.5.2 The maximum volume of CO_2 produced (2)

[13]

QUESTION 6 (Start on a new page)

Nitrogen dioxide gas (NO_2(g)) and sulphur dioxide gas (SO_2(g)) are allowed to react in a closed container. Equilibrium is reached at 700 ºC. The equation for the reaction is:

$$NO_2(g) + SO_2(g) \rightleftharpoons SO_3(g) + NO(g)$$

6.1 State Le Chatelier's Principle. (3)

6.2 How will the amount of SO_3(g) at equilibrium be affected by each of the changes below?
(Write down only: INCREASES, DECREASES or STAYS THE SAME.)

6.2.1 0,5 mol of NO_2(g) is added to the equilibrium mixture. (2)

6.2.2 A catalyst is added. (2)

6.2.3 The pressure in the container is increased by decreasing the volume. (2)

[9]

QUESTION 7 (Start on a new page)

A learner is provided with 50 cm^3 of dilute hydrochloric acid with a concentration of 0,35 $mol.dm^{-3}$.

7.1 What is meant by a **dilute acid solution**? (2)

7.2 The reaction between hydrochloric acid and potassium hydroxide is given by the following balanced equation:

$$HC\ell(aq) + KOH(aq) \rightarrow KC\ell(aq) + H_2O(\ell)$$

7.2.1 Consider the following indicators:

Indicator	pH range
Methyl orange	3,1 – 4,4
Phenol red	6,8 – 8,4
Alizarin yellow	10,1 – 12,0

Which indicator is the most suitable for use in this reaction? (2)

7.2.2 Give a reason for your choice in QUESTION 7.2.1. (2)

7.2.3 Calculate the number of moles of hydrogen ions present in the hydrochloric acid solution. (3)

7.2.4 If the 50cm^3 hydrochloric acid is neutralised by 70cm^3 potassium hydroxide solution, calculate the concentration of the potassium hydroxide solution. (4)

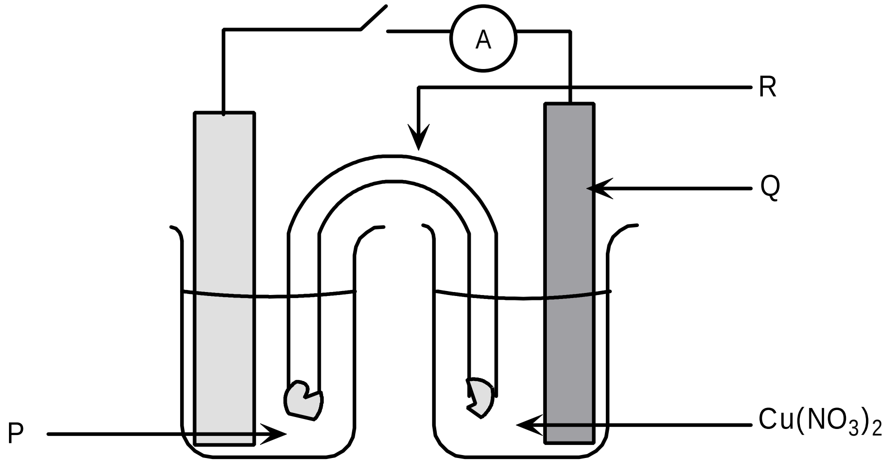
[13]

QUESTION 8 (Start on a new page)

When a zinc strip is placed in a copper(II) nitrate solution, the strip becomes coated with copper.

8.1 Write down the oxidation half-reaction for the reaction that takes place. (2)

8.2 A standard electrochemical cell is set up using the zinc strip and a 1 mol.dm^{-3} copper(II) nitrate solution.
See the diagram below.



Write down the chemical formula/symbol for each of the following:

8.2.1 The solution labelled P (2)

8.2.2 The electrode labelled Q (2)

8.2.3 The solution found in R (2)

8.3 If the cell delivers current for some time, what will happen to each of the following?
(Write down only INCREASES, DECREASES or STAYS THE SAME.)

8.3.1 The mass of the zinc strip (2)

8.3.2 The concentration of solution P (2)

8.4 In which direction will the positive ions move in the salt bridge?
(Choose from: Towards electrode Q or towards the zinc electrode)
(1)
[13]

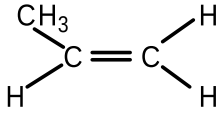
QUESTION 9 (Start on a new page)

9.1 Write down the functional group for each of the following organic compounds.

9.1.1 Carboxylic acids (2)

9.1.2 Alkynes (2)

9.2 Propene gas is bubbled through a **small quantity** of liquid bromine in a test tube. The formula for propene is as shown:



9.2.1 What will be observed in the test tube? (2)

9.2.2 Using structural formulae for the organic compounds, write down an equation for the reaction that takes place. (4)

9.2.3 Write down the IUPAC name for the product of this reaction. (2)

[12]

TOTAL: 150

DEPARTMENT OF EDUCATION
DEPARTEMENT VAN ONDERWYS

SENIOR CERTIFICATE EXAMINATION
SENIORSERTIFIKAAT-EKSAMEN

DATA FOR PHYSICAL SCIENCE
PAPER 2 (CHEMISTRY)

GEGEWENS VIR NATUUR- EN SKEIKUNDE
VRAESTEL 2 (CHEMIE)

TABLE 1: PHYSICAL CONSTANTS

TABEL 1: FISIESE KONSTANTE

Avogadro's constant *Avogadro-konstante*	N_A or/of L	6,02 x 10^{23} mol^{-1}
Molar gas constant *Molêre gaskonstante*	R	8,31 $J.K^{-1}.mol^{-1}$
Standard pressure *Standaarddruk*	p^{θ}	1,013 x 10^5 Pa
Molar gas volume at STP *Molêre gasvolume by STD*	V_m	22,4 $dm^3.mol^{-1}$
Standard temperature *Standaardtemperatuur*	T^{θ}	273 K

TABLE 2: FORMULAE

TABEL 2: FORMULES

$\frac{p_1V_1}{T_1} = \frac{p_2V_2}{T_2}$	$\frac{c_aV_a}{c_bV_b} = \frac{n_a}{n_b}$
$pV = nRT$	$K_w = [H^+][OH^-] = 10^{-14}$ *at by/* 298 K
$n = \frac{m}{M}$	$pH = -\log[H^+]$
$c = \frac{n}{V}$	$E^{\theta}_{cell} = E^{\theta}_{oxidising\ agent} - E^{\theta}_{reducing\ agent}$ $E^{\theta}_{sel} = E^{\theta}_{oksideermiddel} - E^{\theta}_{reduseermiddel}$
$c = \frac{m}{MV}$	$E^{\theta}_{cell} = E^{\theta}_{cathode} - E^{\theta}_{anode}$ $E^{\theta}_{sel} = E^{\theta}_{katode} - E^{\theta}_{anode}$

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

KEY/*SLEUTEL*

Atomic number
Atoomgetal

Electronegativity
Elektronegatiwiteit

29
1,9 Cu
63,5

Symbol
Simbool

Relative atomic mass (approximately)
Relatiewe atoommassa (benaderd)

I	II											III	IV	V	VI	VII	0
1 2,1 H 1																	2 He 4
3 1,0 Li 7	4 1,5 Be 9											5 2,0 B 11	6 2,5 C 12	7 3,0 N 14	8 3,5 O 16	9 4,0 F 19	10 Ne 20
11 0,9 Na 23	12 1,2 Mg 24											13 1,5 Aℓ 27	14 1,8 Si 28	15 2,1 P 31	16 2,5 S 32	17 3,0 Cℓ 35,5	18 Ar 40
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-reaction/*Halfreaksie*	**E° /volt**
$F_2 + 2e^- \rightleftharpoons 2F^-$	+2,87
$H_2O_2 + 2H^+ + 2e^- \rightleftharpoons 2H_2O$	+1,77
$MnO_4^- + 8H^+ + 5e^- \rightleftharpoons Mn^{2+} + 4H_2O$	+1,51
$Au^{3+} + 3e^- \rightleftharpoons Au$	+1,42
$C\ell_2 + 2e^- \rightleftharpoons 2C\ell^-$	+1,36
$Cr_2O_7^{2-} + 14H^+ + 6e^- \rightleftharpoons 2Cr^{3+} + 7H_2O$	+1,33
$O_2 + 4H^+ + 4e^- \rightleftharpoons 2\ H_2O$	+1,23
$MnO_2 + 4H^+ + 2e^- \rightleftharpoons Mn^{2+} + 2H_2O$	+1,21
$Pt^{2+} + 2e^- \rightleftharpoons Pt$	+1,20
$Br_2 + 2e^- \rightleftharpoons 2Br^-$	+1,09
$NO_3^- + 4H^+ + 3e^- \rightleftharpoons NO + 2H_2O$	+0,96
$Ag^+ + e^- \rightleftharpoons Ag$	+0,80
$NO_3^- + 2H^+ + e^- \rightleftharpoons NO_2 + H_2O$	+0,80
$Hg^{2+} + 2e^- \rightleftharpoons Hg$	+0,79
$Fe^{3+} + e^- \rightleftharpoons Fe^{2+}$	+0,77
$O_2 + 2H^+ + 2e^- \rightleftharpoons H_2O_2$	+0,68
$I_2 + 2e^- \rightleftharpoons 2I^-$	+0,54
$SO_2 + 4H^+ + 4e^- \rightleftharpoons S + 2H_2O$	+0,45
$2H_2O + O_2 + 4e^- \rightleftharpoons 4OH^-$	+0,40
$Cu^{2+} + 2e^- \rightleftharpoons Cu$	+0,34
$SO_4^{2-} + 4H^+ + 2e^- \rightleftharpoons SO_2 + 2H_2O$	+0,17
$Cu^{2+} + e^- \rightleftharpoons Cu^+$	+0,16
$Sn^{4+} + 2e^- \rightleftharpoons Sn^{2+}$	+0,15
$S + 2H^+ + 2e^- \rightleftharpoons H_2S$	+0,14
$\mathbf{2H^+ + 2e^- \rightleftharpoons H_2}$	**0,00**
$Fe^{3+} + 3e^- \rightleftharpoons Fe$	-0,04
$Pb^{2+} + 2e^- \rightleftharpoons Pb$	-0,13
$Sn^{2+} + 2e^- \rightleftharpoons Sn$	-0,14
$Ni^{2+} + 2e^- \rightleftharpoons Ni$	-0,25
$Co^{2+} + 2e^- \rightleftharpoons Co$	-0,28
$Cd^{2+} + 2e^- \rightleftharpoons Cd$	-0,40
$Fe^{2+} + 2e^- \rightleftharpoons Fe$	-0,44
$Cr^{3+} + 3e^- \rightleftharpoons Cr$	-0,74
$Zn^{2+} + 2e^- \rightleftharpoons Zn$	-0,76
$2H_2O + 2e^- \rightleftharpoons H_2 + 2OH^-$	-0,83
$Mn^{2+} + 2e^- \rightleftharpoons Mn$	-1,18
$A\ell^{3+} + 3e^- \rightleftharpoons A\ell$	-1,66
$Mg^{2+} + 2e^- \rightleftharpoons Mg$	-2,37
$Na^+ + e^- \rightleftharpoons Na$	-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 oksideervermoë* ↑

Increasing reducing ability / *Toenemende reduseervermoë* ↓

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

Half-reaction / *Halfreaksie*				**E° /volt**
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	-2,37
$A\ell^{3+}$	+ $3e^-$	⇌	$A\ell$	-1,66
Mn^{2+}	+ $2e^-$	⇌	Mn	-1,18
$2H_2O$	+ $2e^-$	⇌	$H_2 + 2OH^-$	-0,83
Zn^{2+}	+ $2e^-$	⇌	Zn	-0,76
Cr^{3+}	+ $3e^-$	⇌	Cr	-0,74
Fe^{2+}	+ $2e^-$	⇌	Fe	-0,44
Cd^{2+}	+ $2e^-$	⇌	Cd	-0,40
Co^{2+}	+ $2e^-$	⇌	Co	-0,28
Ni^{2+}	+ $2e^-$	⇌	Ni	-0,25
Sn^{2+}	+ $2e^-$	⇌	Sn	-0,14
Pb^{2+}	+ $2e^-$	⇌	Pb	-0,13
Fe^{3+}	+ $3e^-$	⇌	Fe	-0,04
$2H^+$	**+ $2e^-$**	⇌	**H_2**	**0,00**
$S + 2H^+$	+ $2e^-$	⇌	H_2S	+0,14
Sn^{4+}	+ $2e^-$	⇌	Sn^{2+}	+0,15
Cu^{2+}	+ e^-	⇌	Cu^+	+0,16
$SO_4^{2-} + 4H^+$	+ $2e^-$	⇌	$SO_2 + 2H_2O$	+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
I_2	+ $2e^-$	⇌	$2I^-$	+0,54
$O_2 + 2H^+$	+ $2e^-$	⇌	H_2O_2	+0,68
Fe^{3+}	+ e^-	⇌	Fe^{2+}	+0,77
Hg^{2+}	+ $2e^-$	⇌	Hg	+0,79
$NO_3^- + 2H^+$	+ e^-	⇌	$NO_2 + H_2O$	+0,80
Ag^+	+ e^-	⇌	Ag	+0,80
$NO_3^- + 4H^+$	+ $3e^-$	⇌	$NO + 2H_2O$	+0,96
Br_2	+ $2e^-$	⇌	$2Br^-$	+1,09
Pt^{2+}	+ $2e^-$	⇌	Pt	+1,20
$MnO_2 + 4H^+$	+ $2e^-$	⇌	$Mn^{2+} + 2H_2O$	+1,21
$O_2 + 4H^+$	+ $4e^-$	⇌	$2\ H_2O$	+1,23
$Cr_2O_7^{2-} + 14H^+$	+ $6e^-$	⇌	$2Cr^{3+} + 7H_2O$	+1,33
$C\ell_2$	+ $2e^-$	⇌	$2C\ell^-$	+1,36
Au^{3+}	+ $3e^-$	⇌	Au	+1,42
$MnO_4^- + 8H^+$	+ $5e^-$	⇌	$Mn^{2+} + 4H_2O$	+1,51
$H_2O_2 + 2H^+$	+ $2e^-$	⇌	$2H_2O$	+1,77
F_2	+ $2e^-$	⇌	$2F^-$	+2,87

Increasing oxidising ability / *Toenemende oksideervermoë* ↓

Increasing reducing ability / *Toenemende reduseervermoë* ↑

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PHYSICAL SCIENCE STANDARD GRADE SECOND PAPER (CHEMISTRY)
NATUUR- EN SKEIKUNDE STANDAARDGRAAD TWEEDE VRAESTEL (CHEMIE)

1.1	A	B	C	D
1.2	A	B	C	D
1.3	A	B	C	D
1.4	A	B	C	D
1.5	A	B	C	D
1.6	A	B	C	D
1.7	A	B	C	D
1.8	A	B	C	D
1.9	A	B	C	D
1.10	A	B	C	D
1.11	A	B	C	D
1.12	A	B	C	D
1.13	A	B	C	D
1.14	A	B	C	D
1.15	A	B	C	D

For the use of the marker *Vir die gebruik van die nasiener*	
Marks obtained *Punte behaal*	
Marker's initials *Nasiener se paraaf*	
Marker's number *Nasiener se nommer*	

15 x 3 = [45]