education

Department:
Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATION - 2006

PHYSICAL SCIENCE P2 : CHEMISTRY

STANDARD GRADE

FEBRUARY/MARCH 2006

304-2/2 E

Marks: 150

This paper consists of 12 pages and a datasheet of 4 pages.

2 Hours

PHYSICAL SCIENCE SG: Paper 2

304 2 2E SG

X05

GENERAL INSTRUCTIONS

1. Write your **examination number** (and **centre number** if applicable) in the appropriate spaces on the answer book.
2. Answer **ALL** the questions.
3. Non-programmable calculators may be used.
4. Appropriate mathematical instruments may be used.
5. Data sheets are attached for your use.
6. Marks may be forfeited if instructions are not followed.

QUESTION 1

INSTRUCTIONS

1. Answer this question on the specially printed **ANSWER SHEET.** *[NOTE: The answer sheet may be either a separate sheet provided as part of your question paper, or printed as part of the answer book.]* Write your **EXAMINATION NUMBER** (and **centre number** if applicable) in the appropriate spaces if a separate answer sheet is used.

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

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

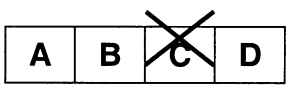
4. If more than one block is marked, no marks will be awarded for that answer.

EXAMPLE:

QUESTION: The SI unit of time is ...

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

ANSWER:



1.1 Which one of the following industrial processes can be used to prepare ammonia gas?

A Haber process

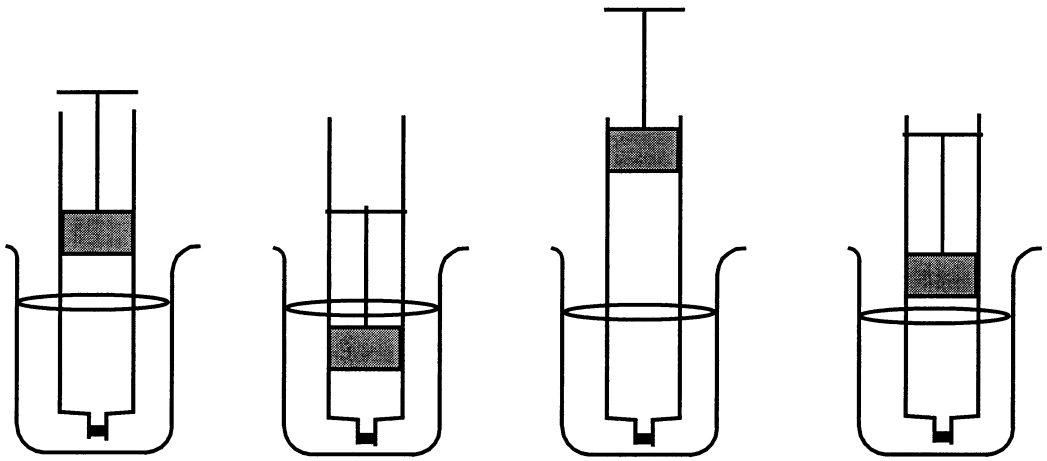
B Contact process

C Ostwald process

D Electrolysis of brine (3)

1.2 A quantity of helium gas is sealed in a gas syringe at room temperature (298 K). The plunger is free to move. The syringe is now placed in beakers with water at different temperatures.

Which one of the following diagrams indicates the gas volume in the syringe at the highest temperature?



(3)

1.3 In which one of the following compounds will hydrogen bonding **NOT** be present?

A NH_3
B HF
C H_2O
D $CHC\ell_3$ (3)

1.4 In which one of the following reactions is ammonia (NH_3) oxidised?

A $NH_3 + H_2O \rightarrow NH_4^+ + OH^-$

B $NH_3 + HC\ell \rightarrow NH_4C\ell$

C $2NH_3 + H_2SO_4 \rightarrow (NH_4)_2SO_4$

D $4NH_3 + 5O_2 \rightarrow 4NO + 6H_2O$ (3)

1.5 Which one of the following statements with regard to chlorine gas is **INCORRECT**?

A It is insoluble in water.

B It can be collected by the upward displacement of air.

C It oxidises I^- ions to I_2.

D It is released when warm concentrated hydrochloric acid is added to MnO_2. (3)

1.6 Magnesium ribbon is added to a diluted hydrochloric acid solution in a test tube. Which one of the following will **NOT** increase the rate at which hydrogen is produced?

A Using magnesium powder.

B Using a smaller piece of magnesium ribbon.

C Heating the acid solution.

D Adding a few drops of concentrated acid. (3)

1.7 Consider the ionisation reaction of sulphuric acid in water:

$$H_2SO_4 + H_2O \rightleftharpoons H_3O^+ + HSO_4^-$$

Which one of the following statements is correct?

A H_3O^+ is the conjugate base of H_2SO_4.

B HSO_4^- is the conjugate base of H_2O.

C H_3O^+ is the conjugate acid of H_2O.

D H_2O is acting as an acid. (3)

1.8 Which one of the following 0,1 mol.dm^{-3} solutions has the lowest pH?

A $HC\ell(aq)$

B $CH_3COOH(aq)$

C $NH_4OH(aq)$

D $(COOH)_2(aq)$ (3)

Questions 1.9 and 1.10 refer to the following reaction that has reached equilibrium in a closed container.

$$2SO_{2(g)} + O_{2(g)} \rightleftharpoons 2SO_{3(g)} \qquad \Delta H < 0$$

1.9 Which one of the following statements regarding the above reaction is correct?

A The reaction that produces SO_3 is exothermic.

B Energy (heat) is consumed in the forward reaction.

C The potential energy of the product SO_3 is higher than that of the reactants SO_2 and O_2.

D The temperature of the container in which the reaction occurs, decreases. (3)

1.10 The pressure in the container is doubled by decreasing the volume. Which one of the following statements is correct?

The number of moles of …

A SO_3 will decrease.

B all the substances will remain constant.

C SO_3 only will increase.

D SO_2 only will decrease. (3)

1.11 Concentrated hydrochloric acid is slowly added to a saturated solution of sodium chloride. A white precipitate forms. This is an example of …

A an acid-base reaction.

B a redox reaction.

C a displacement reaction.

D the common ion effect. (3)

1.12 A standard Zn-Cu electrochemical cell is delivering current. Which one of the following statements is correct?

A The mass of the zinc electrode increases.

B The copper electrode undergoes oxidation.

C Electrons flow through the salt bridge to complete the circuit.

D Electrons flow from the zinc to the copper electrode in the external circuit. (3)

1.13 In the reaction

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

the reducing agent is…

A Cd

B Cu^{2+}

C Cd^{2+}

D Cu^{+} (3)

1.14 In which one of the following chemical processes does hydrogenation occur?

A Burning of hexane

B Preparation of margarine

C Dry cleaning

D Welding using an oxyacetylene blowtorch (3)

1.15 Which one of the compounds below is an alkyne?

A C_4H_8

B C_2H_2

C C_3H_8

D CH_3OH (3)

[45]

ANSWER QUESTIONS 2 – 8 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 your working (this includes substitutions).
4. Number your answers in the same way that the questions are numbered.

QUESTION 2

2.1 Sally prepares a standard sodium carbonate (Na_2CO_3) solution of concentration 0,5 mol.dm^{-3} in a volumetric flask of volume 200 cm^3.

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

2.1.2 Calculate the number of moles of Na_2CO_3 in the volumetric flask. (3)

2.1.3 Calculate the mass of crystals Sally must weigh off in order to obtain the correct concentration of 0,5 mol.dm^{-3} in the volumetric flask. (3)

2.2 John conducts an experiment to establish the relationship between the pressure and volume of an enclosed mass of gas.

He records the following data during his experiment:

PRESSURE (kPa)	VOLUME (dm^3)
100	5,00
150	3,33
200	2,50
250	2,00

2.2.1 Name the law that is illustrated by the above results of the experiment. (2)

2.2.2 Apart from ensuring that no gas escapes during the experiment, what other factor needs to stay constant during this experiment? (1)

2.2.3 The law named in QUESTION 2.2.1 is only valid when the gas acts like an ideal gas. Under which conditions of pressure and temperature will most gases **NOT** act like an ideal gas? (2)

2.2.4 Use the data in the table and calculate the pressure of the enclosed mass of gas when the volume of the gas changes to 6,00 dm^3. (4)
[17]

QUESTION 3 (START ON A NEW PAGE)

3.1 Sulphur dioxide gas can be prepared in the laboratory by the reaction of HCℓ with Na_2SO_3.

3.1.1 Write down the balanced equation for this reaction. (3)

Sulphur dioxide reacts with hydrogen sulphide gas in a gas jar.

3.1.2 Which one of the above gases is oxidised during the reaction? (1)

3.1.3 Write down the **NAMES** of the products of the reaction between sulphur dioxide gas and hydrogen sulphide gas. (2)

3.2 Concentrated sulphuric acid (H_2SO_4) is an excellent dehydrating agent.

3.2.1 What is meant by the term **dehydrating agent**? (2)

3.2.2 Write down the observation that is made when concentrated sulphuric acid is dropped onto $CuSO_4.5H_2O$ crystals. (2)

[10]

QUESTION 4 (START ON A NEW PAGE)

4.1 Sandile places copper turnings in a test tube and adds **concentrated nitric acid**.

4.1.1 Write down the **NAME** of the gas formed in the test tube. (2)

4.1.2 Write down the **NAME** of the salt that forms in the test tube. (2)

4.1.3 Make use of the table of Standard Reduction Potentials and write down the equation for the half reaction that shows the formation of the gas. (2)

4.2 Hydrogen chloride gas can be produced in the laboratory through the reaction of sodium chloride and concentrated sulphuric acid.

4.2.1 Write the balanced equation that shows this preparation of hydrogen chloride gas. (3)

4.2.2 Hydrogen chloride gas is highly soluble in water. Write down the common name given to a solution of HCℓ in water. (2)

4.2.3 How is hydrogen chloride gas collected?
(Choose from **DOWNWARD DISPLACMENT OF WATER, UPWARD DISPLACEMENT OF AIR** or **DOWNWARD DISPLACEMENT OF AIR.**) (2)

[13]

QUESTION 5 (START ON A NEW PAGE)

Nitrogen and hydrogen react at 500 °C in a closed container and reach equilibrium after some time. The equation for the reaction is:

$$3H_{2(g)} + N_{2(g)} \rightleftharpoons 2NH_{3(g)} + \text{heat}$$

5.1 Is this reaction **exothermic** or **endothermic**? (1)

5.2 In industry hydrogen gas and nitrogen gas are reacted in the presence of Fe and Fe_2O_3. What is the purpose of the Fe and Fe_2O_3? (2)

5.3 The **RATE** of which reaction(s) will be increased if the following changes occur? (Write only **FORWARD, REVERSE** or **BOTH**.)

5.3.1 Addition of Fe and Fe_2O_3 (2)

5.3.2 Increase in the temperature (2)

5.3.3 Increase in pressure by decreasing the volume (2)

5.4 How would the following changes affect the **YIELD of NH_3** in the above equilibrium?
(Write only **INCREASES, DECREASES** or **STAYS THE SAME**.)

5.4.1 Reduce the temperature to 250 °C (2)

5.4.2 Pump 0,1 mol hydrogen gas into the container (2)
[13]

QUESTION 6 (START ON A NEW PAGE)

6.1 Consider the following solutions:

Nitric acid (HNO_3)
Sulphuric acid (H_2SO_4)
Oxalic acid ($C_2O_4H_2$)

6.1.1 Write down the balanced equation for the ionisation of nitric acid in water. (2)

6.1.2 Which common ion is formed in aqueous solutions of all three acids? (2)

6.1.3 Which one of the acids is a monoprotic acid? (2)

6.1.4 Which one of the acids is the weakest acid? (2)

6.2 Water is an **ampholyte**.

6.2.1 Explain the term **ampholyte**. (2)

6.2.2 Write down an equation (or two separate equations) to show that water is an ampholyte. (4)

6.3 In an acid-base reaction 50 cm^3 of a sodium hydroxide solution of concentration 0,1 $mol.dm^{-3}$ neutralises 40 cm^3 of an oxalic acid solution. The equation for the reaction is:

$$(COOH)_2 + 2\ NaOH \rightarrow (COONa)_2 + 2\ H_2O$$

6.3.1 Calculate the number of moles of NaOH used. (3)

6.3.2 Calculate the number of moles of $(COOH)_2$ that was neutralised. (2)

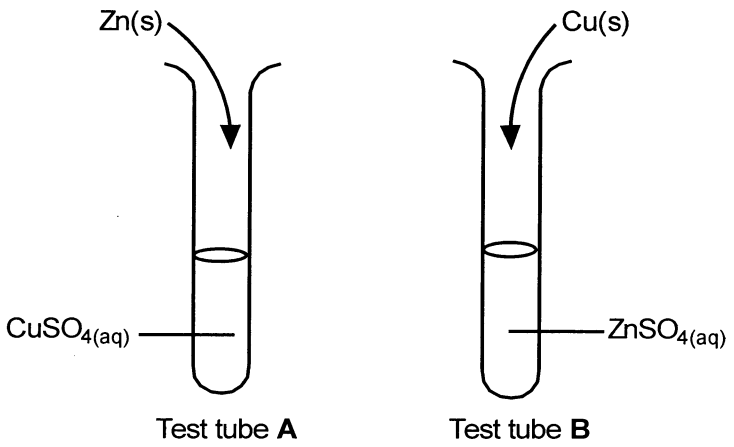
6.3.3 Calculate the concentration of the oxalic acid solution. (3)
[22]

QUESTION 7 (START ON A NEW PAGE)

7.1 In test tube **A** zinc granules are added to a solution of copper sulphate.

In test tube **B** copper turnings are added to a solution of zinc sulphate.

In one of the test tubes a reaction takes place, but in the other one no reaction takes place.



7.1.1 In which test tube will a reaction take place? (Write only **A** or **B**.) (1)

7.1.2 Explain why in one of the test tubes no reaction takes place, by referring to the relative strengths of the oxidising and reducing agents. (4)

7.1.3 Write down the balanced equation for the reaction that takes place. (3)

7.1.4 Write down the observations that are made in the test tube in which a reaction takes place. (2)

7.2 Consider the following solutions:

P copper sulphate **Q** potassium permanganate **R** zinc sulphate

7.2.1 If the above solutions are stirred with a silver (Ag) spoon, a reaction takes place in one of the solutions. In which solution does a reaction take place? (Write down only **P, Q,** or **R**.) (2)

7.2.2 Will the **silver (Ag)** act as an oxidising agent or a reducing agent in the reaction that takes place in QUESTION 7.2.1?
(Write only **OXIDISING AGENT** or **REDUCING AGENT.**) (1)

7.2.3 Write down the equation for the oxidation half reaction that takes place in QUESTION 7.2.1. (2)
[15]

QUESTION 8 (START ON A NEW PAGE)

The boiling point of butane is –1 °C and its melting point is –138 °C.

8.1 Write down the general formula of the homologous series of compounds to which butane belongs. (2)

8.2 Butane is a gas and hexane a liquid at room temperature. Is propane a gas, liquid or solid at room temperature? (2)

8.3 Write down the full structural formula for butane. (Show all bonds.) (2)

8.4 Explain why butane is present as a **liquid** in aerosol cans. (2)

Butane is sometimes used as a fuel.

8.5 In which one of the following is butane gas used as a fuel?
(Write down only **A**, **B** or **C**.)

A	Bunsen burner
B	Oxyacetylene flame
C	Petrol

(2)

8.6 Write a balanced equation for the burning of butane in excess oxygen. (3)

8.7 Name **one** product (besides water) of the incomplete combustion of butane. (2)

[15]

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)

TABEL 1: FISIESE KONSTANTE

TABLE 1: PHYSICAL CONSTANTS

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

TABEL 2: FORMULES

TABLE 2: FORMULAE

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

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

KEY/SLEUTEL

Atoomgetal
Atomic number

Elektronegatiwiteit
Electronegativity

Simbool
Symbol

Relatiewe atoommassa (benaderd)
Relative atomic mass
(approximately)

I	II	III	IV	V	VI	VII	0
2,1 H 1							2 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	10 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	18 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	36 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	54 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

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

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

Increasing oxidising ability / Toenemende oksideervermoë ↓

↑ Increasing reducing ability / Toenemende reduseervermoë

ANSWER SHEET
ANTWOORDBLAD

PHYSICAL SCIENCE SG (SECOND PAPER)/NATUUR- EN SKEIKUNDE SG (TWEEDE VRAESTEL)

Examination number **Eksamennommer**													

DEPARTMENT OF EDUCATION
DEPARTEMENT VAN ONDERWYS

SENIOR CERTIFICATE EXAMINATION **SENIORSERTIFIKAAT-EKSAMEN**

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

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