Province of the
EASTERN CAPE
EDUCATION

NATIONAL SENIOR CERTIFICATE

GRADE 12

SEPTEMBER 2012

PHYSICAL SCIENCES P2

MARKS: **150**

TIME: **3 hours**

* P H S C E 2 *

This question paper consists of 11 pages, 4 data sheets and an answer sheet.

INSTRUCTIONS AND INFORMATION

1. Write your full NAME and SURNAME (and/or Exam Number if applicable) in the appropriate spaces on the ANSWER SHEET and ANSWER BOOK.

2. Answer ALL the questions.

3. This question paper consists of TWO sections:
   SECTION A: 25 marks
   SECTION B: 125 marks

4. Answer SECTION A on the attached ANSWER SHEET and SECTION B in the ANSWER BOOK.

5. Non-programmable calculators may be used.

6. Appropriate mathematical instruments may be used.

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

8. Data Sheets and a Periodic Table are attached for your use.

9. Wherever motivations, discussions, etc. are required, be brief.

SECTION A

Answer this section on the attached ANSWER SHEET.

QUESTION 1: ONE WORD-ITEMS

Give ONE word/term for EACH of the following descriptions. Write only the word/term next to the question number (1.1 − 1.5) on the ANSWER SHEET.

1.1 Isomers that have the same bond order, but a different arrangement of atoms in space (1)

1.2 Collisions which result in the formation of products in a chemical reaction (1)

1.3 The substance which gains electrons during a redox reaction (1)

1.4 The name of the aqueous substance formed as a product of the chloro-alkali industry (1)

1.5 The industrial process during which ammonia is manufactured (1)
[5]

QUESTION 2: MULTIPLE CHOICE QUESTIONS

Four possible options are provided as answers to the following questions. Each question has only ONE correct answer. Choose the best answer and make a cross (**X**) in the appropriate block next to the question number (2.1 − 2.10) on the ANSWER SHEET.

2.1 The following equilibrium constant expression is given for a hypothetical reaction:

$$K_c = \frac{[Y_2Z]^4[XZ_2]^3}{[X_3Y_8][Z_2]^5}$$

For which ONE of the following reactions is the above expression of K_c correct?

A $X_3Y_8\ (g) + 5Z_2(g) \rightleftharpoons 4Y_2Z(g) + 3XZ_2\ (g)$
B $4Y_2Z\ (g) + 3XZ_2\ (g) \rightleftharpoons X_3Y_8\ (g) + 5Z_2\ (g)$
C $2X_3Y_8\ (g) + 7Z_2\ (g) \rightleftharpoons 6XZ_2\ (g) + 8Y_2Z\ (g)$
D $X_3Y_8\ (g) + 5Z_2\ (g) \rightleftharpoons 3Y_2Z\ (g) + 4XZ_2\ (g)$ (2)

2.2 A student sets up an electrolytic cell as follows:

$$Cd\,|\,Cd^{2+}\,\|\,Sn^{2+}\,|\,Sn$$

Which ONE of the following statements is correct?

A Cd is the cathode
B Sn is the positive electrode
C Electrons flow from Sn to Cd
D Cd is reduced (2)

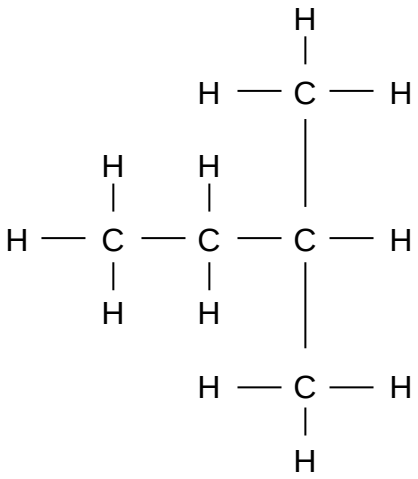
2.3 A copper rod is dipped into a zinc sulphate solution. Which of the following will be observed?

A The copper rod turns a silver colour
B The zinc solution turns blue
C The copper rod becomes eroded
D No observation is made (2)

2.4 In the chemical equation: H_2 (g) + $C\ell_2$ (g) → 2HCℓ (g), the **$C\ell_2$** is the ...

A oxidising agent because it is oxidised.
B oxidising agent because it is reduced.
C reducing agent because it is oxidised.
D reducing agent because it is reduced. (2)

2.5 Consider the organic compound which follows:



The IUPAC name of this compound is ...

A 1,1-dimethylpropane.
B pentane.
C 2-methylbutane.
D 3,3-dimethylpropane. (2)

2.6 Which one of the following compounds represents an alkane?

A C_5H_8
B C_5H_{12}
C C_5H_{10}
D C_5H_7 (2)

2.7 Which organic compound is able to undergo an addition reaction?

A CH_4
B CH_3CH_3
C C_2H_2
D $CHC\ell_3$ (2)

2.8 The homologous series with the general formula C_nH_{2n-2} is the …

A alkynes.
B alkenes.
C alcohols.
D alkanes. (2)

2.9 A bag of fertiliser has the following numbers printed on it: **3:2:5 (26).** The percentage composition of nitrogen in the fertiliser bag is ...

A 7,8%.
B 3%.
C 30%.
D 11,5%. (2)

2.10 Chlorine is one of the major products of the chloro-alkali industry. Which one of the following is NOT an industrial use of chlorine?

A To produce bleaching agents
B To produce disinfectants
C To manufacture ammonia
D To manufacture plastics like PVC (2)

[20]

TOTAL SECTION A: 25

SECTION B

INSTRUCTIONS AND INFORMATION

1. Answer this section in the ANSWER BOOK.
2. Start each question on a NEW page.
3. Leave one line between two subsections, for example between QUESTIONS 3.1 and 3.2.
4. The formulae and substitutions must be shown in ALL calculations.
5. Round off your answers to TWO decimal places.

QUESTION 3 (Start on a new page)

3. Ethanol reacts with oxygen to form ethanoic acid and water.

3.1 Draw the structural formula for ethanoic acid. (2)

3.2 Name the homologous series to which ethanoic acid belongs. (1)

3.3 Use MOLECULAR FORMULAE to write a balanced chemical equation for the above reaction. (3)

3.4 Name the natural process by which ethanol (found in beer and wine) can be derived from fruit and other plant materials. (2)

[8]

QUESTION 4 (Start on a new page)

4.1 2-chlorobutane reacts with sodium hydroxide to form *Product A*, sodium chloride and water.

4.1.1 Draw the structural formula and give the name for the substance represented by *Product A*. (3)

4.1.2 What type of chemical reaction is represented here? (2)

4.1.3 Draw the structural formula for 2-chlorobutane. (2)

4.2 The esters form a group of pleasant smelling compounds.

4.2.1 Draw the functional group of the esters. (2)

4.2.2 Name the TWO general substances needed to form an ester. (2)

4.2.3 What smell is associated with butyl-butanoate? (1)

[12]

QUESTION 5 (Start on a new page)

The table below shows the boiling points for some alkanes, which form a portion of the hydrocarbons found in crude oil.

Alkane	Molecular formula	Boiling point (°C)
Methane	CH_4	-162
Ethane	C_2H_6	-89
Propane	C_3H_8	-42
Butane	C_4H_{10}	0

5.1 What do you understand by the term: *hydrocarbons*? (2)

5.2 Are the substances in the table saturated or unsaturated hydrocarbons? Give a reason for your answer. (3)

5.3 The first three substances in the table are all gases at room temperature. Is butane a solid, a liquid or a gas at room temperature? (1)

5.4 What is the functional group of the alkanes? (1)

5.5 Use the table to derive the general formula for the alkanes. (2)

5.6 Describe the trend in boiling point that is evident from the data. (2)

5.7 Explain why this trend occurs in this type of molecule. (4)

5.8 Draw the structural formula for the isomer of butane. (2)

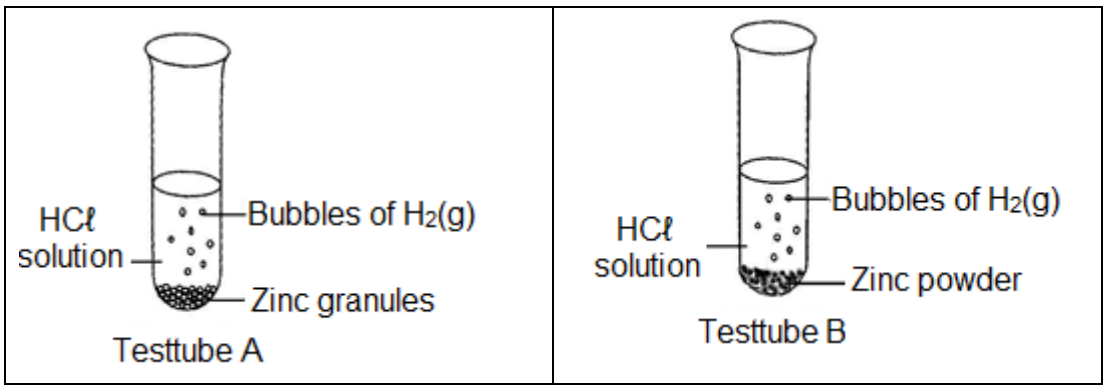
5.9 Give the IUPAC name for the compound drawn in QUESTION 5.8. (2)

5.10 The boiling point for the *isomer of butane* is lower than that of *butane*, yet they have the same molecular formula. Give an explanation for this difference in boiling point. (2)

[21]

QUESTION 6 (Start on a new page)

6. A group of learners decide to do an investigation into reaction rates. They add the same amount of hydrochloric acid (HCℓ) solution, at a concentration of 1 mol·dm^{-3}, to two separate test tubes. Into each of these test tubes they add 1 g of zinc granules and 1 g of zinc powder respectively, at the same time.



6.1 State an investigative question for the investigation which is illustrated above. (2)

6.2 Name ONE way in which the learners can measure the reaction rate for this reaction. (2)

6.3 In which test tube (A or B) will the formation of H_2 (g) take place at a more rapid rate? Give a reason for your answer. (3)

6.4 In what way will the rate at which H_2(g) is formed in test tube A be affected if more HCℓ-solution of the same concentration was added to the test tube?

Write only INCREASE, DECREASE or STAY THE SAME as your answer. (2)

6.5 Besides adding more zinc or a catalyst, state ONE way in which the rate of formation of H_2(g) can be increased in both test tubes. (2)

6.6 Use the collision theory to explain how the reaction rate is increased according to your answer in QUESTION 6.5. (2)

6.7 Besides H_2 (g), which other product will be formed as a result of this reaction? Write only the FORMULA of this product as your answer. (1)

6.8 Write a balanced chemical equation for the reaction between zinc and hydrochloric acid. (3)

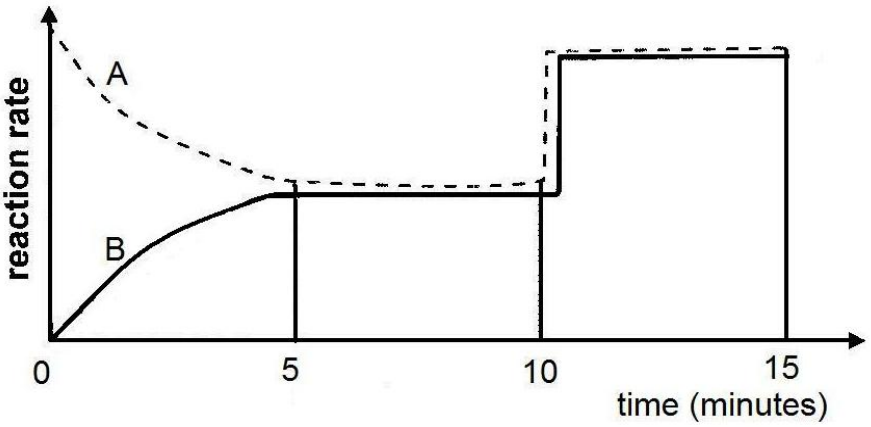
6.9 Assume that for the above reaction, $\Delta H<0$ kJ·mol^{-1} and the activation energy is 350 kJ·mol^{-1}. Is the reaction endothermic or exothermic? Give a reason for your answer. (3)

[20]

QUESTION 7 (Start on a new page)

7.1 Consider the graph of reaction rate against time for the following hypothetical reaction below:

$$2\ AX\ (g) \rightleftharpoons A_2\ (g) + X_2\ (g) \quad (\Delta H > 0)$$



7.1.1 Which reaction (forward or reverse) is represented by graph A and B respectively? (2)

7.1.2 Give an explanation for your answers in QUESTION 7.1.1 above. (3)

7.1.3 What is represented by the section of the graph between 5 and 10 minutes? (2)

7.1.4 At a time of 10 minutes, a change is brought about in the equilibrium system. What change (PRESSURE, TEMPERATURE or CONCENTRATION) is brought about? (2)

7.1.5 Explain the effect of the change mentioned in QUESTION 7.1.4 on the equilibrium system. (3)

7.1.6 Use Le Chatelier's principle to explain the effect that a decrease in temperature will have on the equilibrium system. (3)

7.2 The following reaction reaches equilibrium in a closed container at a fixed temperature T:

$$2\ SO_3\ (g) \rightleftharpoons 2\ SO_2\ (g) + O_2\ (g)$$

At equilibrium, the following was discovered:

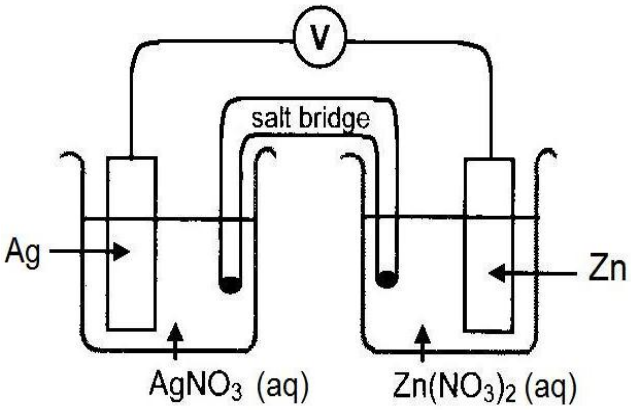
$[SO_3] = 0{,}04\ mol{\cdot}dm^{-3}$
$[SO_2] = 0{,}5\ mol{\cdot}dm^{-3}$
the mass of $O_2 = 19{,}2\ g$
$K_c = 31{,}25$

Calculate the volume of the container. (8)

[23]

QUESTION 8 (Start on a new page)

8.1 The following cell is set up in a laboratory by a group of learners:



8.1.1 What type of cell is represented here? (1)

8.1.2 Give the cell notation for this cell. (3)

8.1.3 Which electrode (Zn or Ag) is the anode in this cell? (1)

8.1.4 What type of reaction takes place at the anode: oxidation OR reduction? (1)

8.1.5 Write the half-reaction that occurs at the anode. (2)

8.1.6 Write the half-reaction that occurs at the cathode. (2)

8.1.7 Use the answers to QUESTIONS 8.1.5 and 8.1.6 to show the overall cell reaction. (4)

8.1.8 Calculate the emf of the cell. (4)

8.2 Define the following terms:

8.2.1 Electroplating (2)

8.2.2 Electrorefining (2)

[22]

QUESTION 9 (Start on a new page)

9.1 The common lead-acid battery, used to start motor vehicles, is composed of a number of galvanic cells, each having an emf of about 2 V. These are connected in series so that their voltages are additive. Most motor vehicle batteries contain six such cells and give about 12 V, but 6 V, 24 V and 32 V batteries are also available.

9.1.1 Is the lead acid battery an example of a primary or secondary cell? Explain. (2)

9.1.2 What type of energy transformation takes place in the cell whilst it is discharging? (2)

9.1.3 98% of a lead-acid battery can be recycled. Name THREE components of the battery that can be recycled and explain, in your own words, how they are recycled. (6)

9.2 Many farmers are reverting back to organic farming methods by making use of organic fertilisers. One reason for this is the fact that *inorganic* fertilisers, which need to be soluble in water, can have negative effects on the environment. One such effect is eutrophication, which occurs if too much *inorganic* fertiliser is applied just before heavy rains.

9.2.1 What are organic fertilisers? (2)

9.2.2 Explain in detail how eutrophication occurs. (5)

9.2.3 Ammonium sulphate is an important nitrogen containing fertiliser which is soluble in water. Give the formula for ammonium sulphate. (2)

[19]

TOTAL SECTION B: 125

GRAND TOTAL: 150

NATIONAL SENIOR CERTIFICATE
NASIONALE SENIOR SERTIFIKAAT

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

NAAM/*NAME*	SIMBOOL/*SYMBOL*	WAARDE/*VALUE*
Standard pressure Standaarddruk	p^{θ}	$1{,}013 \times 10^5$ Pa
Molar gas volume at STP Molêre gasvolume teen STD	V_m	$22{,}4\ dm^3 \cdot mol^{-1}$
Standard temperature Standaardtemperatuur	T^{θ}	273 K

TABLE 2: FORMULAE/TABEL 2: FORMULES

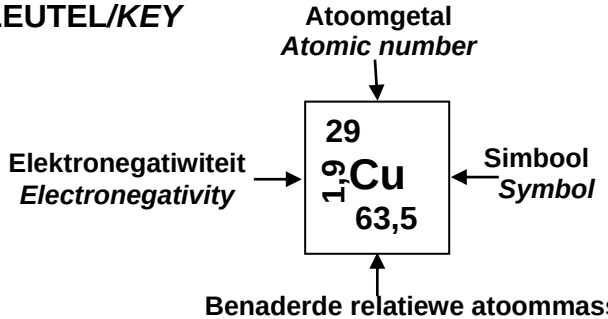
$n = \frac{m}{M}$	$c = \frac{n}{V}$ or/*of* $c = \frac{m}{MV}$
$q = I\Delta t$ $W = Vq$	$E^{\theta}_{cell} = E^{\theta}_{cathode} - E^{\theta}_{anode}$ / $E^{\theta}_{sel} = E^{\theta}_{katode} - E^{\theta}_{anode}$ or/*of* $E^{\theta}_{cell} = E^{\theta}_{reduction} - E^{\theta}_{oxidation}$ / $E^{\theta}_{sel} = E^{\theta}_{reduksie} - E^{\theta}_{oksidasie}$ or/*of* $E^{\theta}_{cell} = E^{\theta}_{oxidising\ agent} - E^{\theta}_{reducing\ agent}$ / $E^{\theta}_{sel} = E^{\theta}_{oksideermiddel} - E^{\theta}_{reduseermiddel}$

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

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)
2,1 1 H 1																	2 He 4
1,0 3 Li 7	1,5 4 Be 9											2.0 5 B 11	2.5 6 C 12	3.0 7 N 14	3.5 8 O 16	4.0 9 F 19	10 Ne 20
0,9 11 Na 23	1,2 12 Mg 24											1.5 13 Aℓ 27	1.8 14 Si 28	2.1 15 P 31	2.5 16 S 32	3.0 17 Cℓ 35,5	18 Ar 40
0,8 19 K 39	1,0 20 Ca 40	1,3 21 Sc 45	1,5 22 Ti 48	1,6 23 V 51	1,6 24 Cr 52	1,5 25 Mn 55	1,8 26 Fe 56	1,8 27 Co 59	1,8 28 Ni 59	1,9 29 Cu 63,5	1,6 30 Zn 65	1,6 31 Ga 70	1,8 32 Ge 73	2,0 33 As 75	2,4 34 Se 79	2,8 35 Br 80	36 Kr 84
0,8 37 Rb 86	1,0 38 Sr 88	1,2 39 Y 89	1,4 40 Zr 91	41 Nb 92	1,8 42 Mo 96	1,9 43 Tc	2,2 44 Ru 101	2,2 45 Rh 103	2,2 46 Pd 106	1,9 47 Ag 108	1,7 48 Cd 112	1,7 49 In 115	1,8 50 Sn 119	1,9 51 Sb 122	2,1 52 Te 128	2,5 53 I 127	54 Xe 131
0,7 55 Cs 133	0,9 56 Ba 137	57 La 139	1,6 72 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	1,8 81 Tℓ 204	1,8 82 Pb 207	1,9 83 Bi 209	2,0 84 Po	2,5 85 At	86 Rn
0,7 87 Fr	0,9 88 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

SLEUTEL/*KEY*



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

Halfreaksies / *Half-reactions*	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

Toenemende oksiderende vermoë/*Increasing oxidising ability*

Toenemende reduserende vermoë/*Increasing reducing ability*

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

Halfreaksies/*Half-reactions*			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

Toenemende oksiderende vermoë/*Increasing oxidising ability*

Toenemende reduserende vermoë/*Increasing reducing ability*

PHYSICAL SCIENCES – PAPER 2
FISIESE WETENSKAPPE – VRAESTEL 2

***ANSWER SHEET* / ANTWOORDBLAD**

NAME AND SURNAME:
NAAM EN VAN: _____

***SECTION A*/AFDELING A**

***QUESTION 1: ONE WORD-ITEMS*/VRAAG 1: EENWOORD-ITEMS**

1.1 _____ (1)

1.2 _____ (1)

1.3 _____ (1)

1.4 _____ (1)

1.5 _____ (1)
[5]

***QUESTION 2: MULTIPLE CHOICE QUESTIONS*/**
VRAAG 2: MEERVOUDIGEKEUSE-VRAE

2.1	A	B	C	D
2.2	A	B	C	D
2.3	A	B	C	D
2.4	A	B	C	D
2.5	A	B	C	D
2.6	A	B	C	D
2.7	A	B	C	D
2.8	A	B	C	D
2.9	A	B	C	D
2.10	A	B	C	D

(10x2) **[20]**

***TOTAL SECTION A*/TOTAAL AFDELING A: 25**