Province of the
EASTERN CAPE
EDUCATION

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REPUBLIC OF SOUTH AFRICA

CHIEF DIRECTORATE – CURRICULUM MANAGEMENT

GRADE 12 LEARNER SUPPORT PROGRAMME

REVISION AND REMEDIAL TEACHING INSTRUMENT: QUESTIONS AND ANSWERS

SUBJECT: PHYSICAL SCIENCES – SECOND PAPER

June 2009

This document consists of 15 pages.

Strictly not for test/examination purposes

INSTRUCTIONS AND INFORMATION

1. Write your name and/or examination number (and centre number if applicable) in the appropriate spaces on the ANSWER SHEET and ANSWER BOOK.

2. Answer ALL the questions.

3. Answer SECTION A on the attached ANSWER SHEET and place the completed answer sheet inside your answer book.

4. Answer SECTION B in the ANSWER BOOK.

5. Non-programmable calculators may be used.

6. Appropriate mathematical instruments may be used.

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

8. Start each question in SECTION B on a new page.

9. Data sheets are attached for your use.

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

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 attached ANSWER SHEET.

1.1 The process when atoms are removed from a molecule to leave a double bond. (1)

1.2 Dividing longer chains of hydrocarbons into shorter chains. (1)

1.3 A substance that speeds up a chemical reaction without itself undergoing any permanent change. (1)

1.4 The difference between the potential energy of the products and the potential energy of the reagents in an exothermic reaction. (1)

1.5 A reaction in which one reactant looses electrons and the other reactant gains electrons. (1)

[5]

QUESTION 2: FALSE ITEMS

The following are FALSE conceptual statements. Write next to the question numbers (2.1 – 2.5) on the attached ANSWER SHEET the CORRECT statement.

2.1 Benzene is a saturated hydrocarbon. (2)

2.2 An amide is formed when a carboxylic acid and an ester react. (2)

2.3 A catalyst reduces the heat of reaction (ΔH). (2)

2.4 An increase in temperature increases the rate of a reaction and the amount of product formed during the reaction. (2)

2.5 A substance that gains electrons in a chemical reaction is the reducing agent. (2)

[10]

QUESTION 3: 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 correct block (A – D) next to the question number (3.1 – 3.5) on the attached ANSWER SHEET.

3.1 Which ONE of the following compounds is saturated?

A. C_4H_{10}
B. C_5H_{10}
C. C_5H_9OH
D. C_6H_{10} (2)

3.2 Which ONE of the following compounds has the molecular formula C_2H_6O?

A. Methanol
B. Dimethylether
C. Methylethanoate
D. Ethanal (2)

3.3 When a chemical reaction is exothermic, …

A. more heat energy is absorbed than released.
B. ΔH is positive.
C. the products have less energy than the reactants.
D. the products have more energy than the reactants. (2)

3.4 The minimum energy required to start a chemical reaction:

A. Bonding energy
B. Ionization energy
C. Lattice energy
D. Activation energy (2)

3.5 Lead-acid batteries can explode if over charged. This is due to …

A. heat.
B. the release of oxygen and hydrogen gas.
C. an increase in acid concentration.
D. an increase of the cell potential. (2)

[10]

TOTAL SECTION A: 25

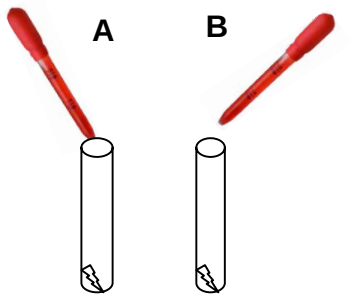
SECTION B

INSTRUCTIONS AND INFORMATION

1. Answer SECTION B in the ANSWER BOOK.
2. The formulae and substitutions must be shown in ALL calculations.
3 Round off your answers to TWO decimal places.
4. Start each question on a new page.

QUESTION 4

Your teacher supplies you with 5 cm^3 of cyclohexane and 5 cm^3 of cyclohexene in two separate test tubes A and B respectively and asks you to find out which one is the more reactive. Approximately 1 cm^3 of bromine water is added to each test tube, which are then shaken and then left to settle.



4.1 Write an investigative question for this investigation. (2)

4.2 Give ONE factor that must be kept constant. (2)

4.3 Write down a hypothesis for this investigation. (2)

4.4 What would you observe in …

4.4.1 test tube A? (2)

4.4.2 test tube B? (2)

4.5 Explain your observation in QUESTION 4.4.2. (2)

4.6 Using structural formulae, write a balanced chemical equation for your answer in QUESTION 4.5. (3)

4.7 Name the type of reaction which occurs between cyclohexene and bromine. (2)

4.8 Give the name of the product formed in QUESTION 4.6. (2)

4.9 Write a conclusion for the above investigation. (2)

[21]

QUESTION 5

Answer the following questions that illustrate the importance of applying your knowledge of organic chemistry in our daily lives.

5.1 When a bottle of white wine is left open for some time, it tastes sour. Name the chemical process that causes the wine to turn sour. (2)

5.2 Give the household name of the product in QUESTION 5.1. (2)

5.3 What effect can the intake of methanol have on the health of a person? (2)

5.4 In what industry is ethyne used? (2)

5.5 Write down a balanced chemical reaction for the process in QUESTION 5.4. (3)

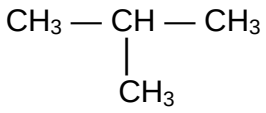
5.6 Name the product that forms when plant oils undergo hydrogenation. (2)

[13]

QUESTION 6

Consider the following organic compounds

A. $CH_3 – CH_2 – CH_2 – CH_3$ B. C_2H_5Br C. CH_3COOH

D. C_2H_5OH E.  F. Methylamine

G. 4,4-dimethyl-2-pentanone H. Methylmethanoate

6.1 For the questions below, write down the letter that corresponds to the correct answer.

Which of the above compounds:

6.1.1 Will neutralize a solution of sodium carbonate? (2)

6.1.2 Is the initial product of fermentation? (2)

6.1.3 Are isomers of each other? (2)

6.1.4 Have a functional group $–NH_2$? (2)

6.1.5 Are used as food flavourings and in perfumes. (2)

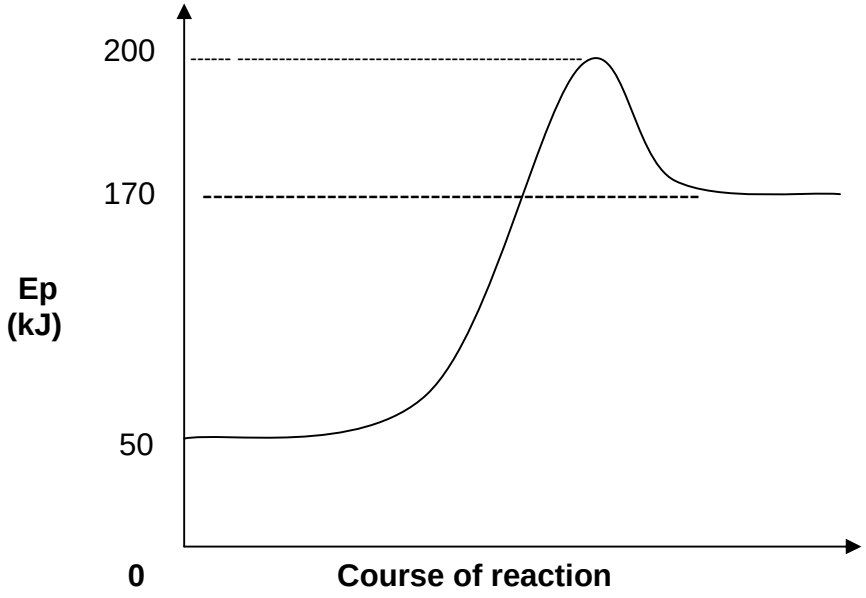
6.2 Write down a balanced chemical equation for the preparation of compound B using an alkane as one of the reactants. (3)

6.3 Write down the structural formula of compound G. (2)

[15]

QUESTION 7

A learner conducts a practical investigation in order to test whether the dissolution of solid ammonium chloride is exothermic or endothermic. The apparatus used include a beaker, the salt and a certain measuring instrument. The figure below shows the energy changes that occur when ammonium chloride dissolves in water.



7.1 What measuring instrument must be used during this investigation? (2)

7.2 What is the function of the instrument mentioned in QUESTION 7.1? (2)

7.3 Will the reading on the instrument used in QUESTION 7.1 **INCREASE**, **DECREASE** or **STAY THE SAME** during the course of the reaction? Give a reason for your answer. (3)

7.4 What is the potential energy of the reactants? (2)

7.5 Calculate ΔH for this reaction. (4)

7.6 Calculate the activation energy for this reaction. (3)

7.7 Draw a similar graph in your answer book and show the effect of the addition of a catalyst. (2)

7.8 On addition of a catalyst, state whether the following will **INCREASE, DECREASE** or **REMAIN THE SAME**:

7.8.1 Energy of the products (2)

7.8.2 Activation energy (2)

7.8.3 Heat of reaction (2)

[24]

QUESTION 8

Thandi and Lucy decided to organize a surprise party for their mother to celebrate her 50th birthday. Thandi inflated balloons using dilute vinegar and bicarbonate of soda in a flask fitted with a stopper and open glass tube. About 0,5 g of bicarbonate of soda is used up in 3 seconds. Lucy prepared the cool drinks and started the fire for the "braai".

8.1 Name the product that makes the inflation process possible. (2)

8.2 Calculate the rate of the reaction between vinegar and bicarbonate of soda. (3)

8.3 Suggest TWO possible ways Thandi can employ to inflate the balloons faster. (4)

8.4 Use your knowledge of science to explain why it is necessary for Lucy to use small pieces of wood when starting the fire for the "braai". (2)

[11]

QUESTION 9

Ammonia is a very useful product which is used extensively by humans for various purposes. It is manufactured at high temperature and pressure according to the reaction:

$$N_2\,(g) + 3H_2\,(g) \leftrightarrows 2NH_3\,(g) \quad \Delta H = -92kJ$$

9.1 Name the above process used to manufacture ammonia. (2)

The reaction takes place in a closed container. Assume that equilibrium has been reached.

9.2 Use Le Chatelier's principle to explain why ammonia is removed at the factory as it is formed. (4)

9.3 Assume that the temperature is decreased at the ammonia factory. What effect does this have on the amount of the product formed? (2)

9.4 Explain why high pressure is used during the production of ammonia. (2)

9.5 In the research laboratory at the plant a chemical engineer carried out an experiment by initially adding 3 mol N_2 (gas) and 8 mol H_2 (gas) in a 2 dm^3 closed container. He uses his knowledge of K_c values to determine the conditions for the maximum production of ammonia at the plant. He has two options to decide between:

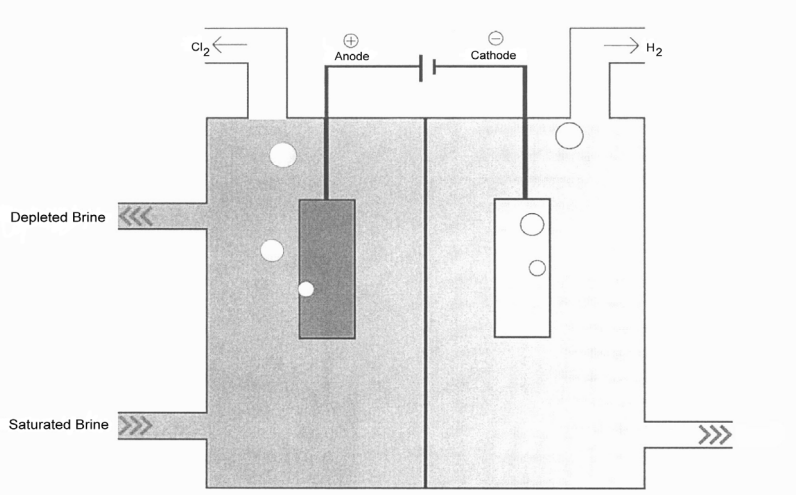
Option 1
At a temperature of 300 K and 410 kPa the engineer gets a K_c value of $2,98 \times 10^{-2}$.

Option 2
At a temperature of 420 K and 450 kPa, the engineer notices that 4 mol of ammonia are present at equilibrium.

Use this information to determine which option is the best for the maximum production of ammonia at the plant. (8)
[18]

QUESTION 10

One of the important applications of electrolysis is the preparation of chemicals. Sodium chloride (common salt) is found in large quantities in the sea and in underground deposits. Sodium chloride solution is called brine. Electrolysis of brine is a very important industrial process which produces three important products for human use in daily life.
The procedure is as follows:
Saturated brine is passed into the first chamber of the cell where chloride ions are oxidised at the anode. At the cathode hydrogen in the water is reduced to hydrogen gas releasing hydroxide ions in the solution.
Study the diagram of a membrane cell given below and answer the questions that follow.



10.1 Two of the products produced are chlorine and hydrogen. Name the other product. (2)

10.2 Hydrogen gas is formed at the negative electrode. Write down this reduction half reaction. (2)

10.3 Write the oxidation half reaction. (2)

10.4 Give the net cell reaction. (3)

10.5 Give ONE use of chlorine. (2)
[11]

QUESTION 11

A group of science learners accompanied by their teacher went on an educational tour by train from East London to Durban. During one of the stopovers at a station one learner noticed that a metal strip is attached over the junction where two rails are joined. The learner, out of curiosity, asked the teacher what the metal is and why it is attached to the rails.
During their onward journey, the teacher decided to give this as a topic for their investigative project. The teacher gave them a hint.

Hint: The metal is placed there to protect the rails. The metal strip used is a stronger reducing agent than iron.

The project involves a planning and designing stage. During the planning stage answers must be found to certain questions.

11.1 Planning stage:

11.1.1 Name the metal used to make rails. (2)

11.1.2 Suggest a suitable metal to use to make the strip that is attached to the rails. (2)

During the designing stage certain processes must be identified to set up this investigation.

11.2 Designing stage:

11.2.1 Give the name of the cathode in this investigation. (2)

11.2.2 Give the anode half reaction. (2)

11.3 Now explain or give a reason why a stronger reducing agent is attached to the rails. (2)

11.4 Name the environmental problem which can be addressed by this investigation. (2)

[12]

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*

NAME/*NAAM*	SYMBOL/*SIMBOOL*	VALUE/*WAARDE*
Standard pressure *Standaarddruk*	p^{θ}	$1{,}013 \times 10^5$ 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

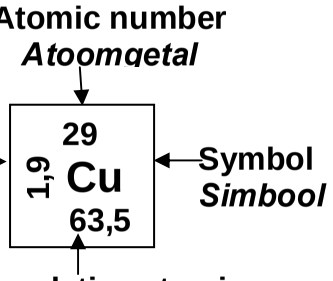
TABLE 2: FORMULAE/*TABEL 2: FORMULES*

$n = \frac{m}{M}$	$c = \frac{n}{V}$
$c = \frac{m}{MV}$	$E^{\theta}_{cell} = E^{\theta}_{cathode} - E^{\theta}_{anode}$ / $E^{\theta}_{sel} = E^{\theta}_{katode} - E^{\theta}_{anode}$ $E^{\theta}_{cell} = E^{\theta}_{reduction} - E^{\theta}_{oxidation}$ / $E^{\theta}_{sel} = E^{\theta}_{reduksie} - E^{\theta}_{oksidasie}$ $E^{\theta}_{cell} = E^{\theta}_{oxidising\ agent} - E^{\theta}_{reducing\ agent}$ / $E^{\theta}_{sel} = E^{\theta}_{oksideermiddel} - E^{\theta}_{reduseermiddel}$

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)
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															

KEY/*SLEUTEL*



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

Increasing oxidising ability/*Toenemende oksiderende vermoë* ↑

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 reducing ability/*Toenemende reduserende vermoë* ↓

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

Increasing oxidising ability/*Toenemende oksiderende vermoë* ↓

↑ Increasing reducing ability/*Toenemende reduserende 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