

EXAMINATION		NATIONAL SENIOR CERTIFICATE
GRADE		12
DATE		MAY/JUNE 2026
SUBJECT		PHYSICAL SCIENCES
PAPER		2
MARK TOTAL		150
DURATION (HOURS)		3
NUMBER OF PAGES		22



SOUTH AFRICAN COMPREHENSIVE ASSESSMENT INSTITUTE
 SUID-AFRIKAANSE KOMPREENSIEWE ASSESSERINGSINSTITUUT



INSTRUCTIONS AND INFORMATION

1. This question paper consists of **NINE QUESTIONS**. Answer **ALL** the questions in the **ANSWER BOOK**.
2. Start each question on a **NEW** page in the answer book.
3. Number the questions 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. Show **ALL** the formulae and substitutions in **ALL** calculations.
8. Round off your final numerical answers to a minimum of **TWO** decimal places.
9. Give brief motivations, discussions, etc. where required.
10. You are advised you use the attached **DATA SHEETS**.
11. Write neatly and legibly, in **BLUE** ink only.
12. Ensure to **ATTACH** the **GRAPH SHEET** for **QUESTION 3.2** to your answer book.



QUESTION 1: MULTIPLE-CHOICE QUESTIONS

Various options are provided as possible answers to the following questions. Each question has only ONE correct answer. Write only the letter (A–D), corresponding to the correct answer of your choice, next to the question numbers (1.1 to 1.10) in the ANSWER BOOK, for example 1.11 D.

1.1 Which ONE of the following is the general formula of carboxylic acids?

- A C_nH_{2n+2}
- B $C_{2n}H_{2n}O_2$
- C C_nH_{2n-2}
- D $C_nH_{2n}O_2$

(2)

1.2 The structures of four organic compounds are shown below:

I	$ \begin{array}{c} \text{CH}_3 \\ \\ \text{CH}_3 - \text{CH} - \text{CH} - \text{CH}_3 \\ \\ \text{OH} \end{array} $	II	$ \begin{array}{c} \text{CH}_3 - \text{CH}_2 - \text{CH} - \text{OH} \\ \\ \text{CH}_2 \\ \\ \text{CH}_3 \end{array} $
III	$ \begin{array}{c} \text{CH}_3 - \text{CH} - \text{CH} - \text{CH}_3 \\ \quad \\ \text{OH} \quad \text{CH}_3 \end{array} $	IV	$ \begin{array}{c} \text{CH}_3 - \text{CH} - \text{CH}_2 - \text{CH}_3 \\ \\ \text{CH}_2 \\ \\ \text{OH} \end{array} $

Which of the above compounds have the same IUPAC name?

- A I and II only
- B III and IV only
- C I and III only
- D II and IV only

(2)

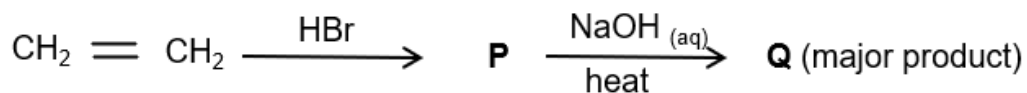
1.3 Which of the following compounds has hydrogen bonds between its molecules?

- A $\text{CH}_3(\text{CH}_2)_2\text{CH}_3$
- B $\text{CH}_3\text{COCH}_2\text{CH}_3$
- C $\text{CH}_3\text{COOCH}_2\text{CH}_3$
- D $\text{CH}_3\text{CH}(\text{OH})\text{CH}_2\text{CH}_3$

(2)



1.4 In the flow diagram below **P** and **Q** represent two organic compounds.



Which ONE of the following is compound **Q**?

- A CH_2CH_2
- B CH_3CH_3
- C $\text{CH}_3\text{CH}_2\text{Br}$
- D $\text{CH}_3\text{CH}_2\text{OH}$

(2)

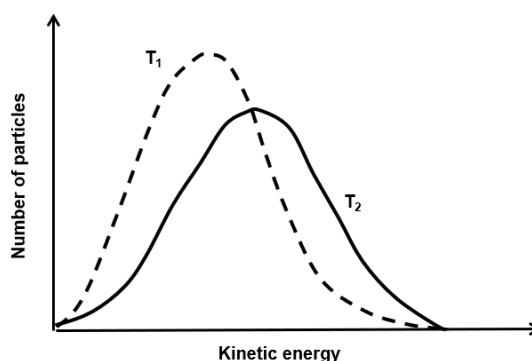
1.5 An oxide of sulphur contains 40% sulphur and 60% oxygen.

The EMPIRICAL FORMULA for this oxide of sulphur is given as ...

- A SO
- B SO_2
- C SO_3
- D SO_4

(2)

1.6 The Maxwell-Boltzmann diagrams for particles in a fixed mass of gas at two different temperatures, T_1 and T_2 , are shown below.



Which ONE of the following is the correct interpretation of the diagrams as the temperature of the gas changes from T_1 to T_2 ?

	ACTIVATION ENERGY (E_A)	NUMBER OF EFFECTIVE COLLISIONS
A	Remains the same	Increases
B	Decreases	Increases
C	Decreases	Remains the same
D	Remains the same	Decreases

(2)



- 1.7 A solution contains equal concentrations of hydrofluoric acid (HF) and nitric acid (HNO₃). Which ONE of the following combinations best explains the strength of the conjugate base and the relative pH of the solution?

	CONJUGATE BASE STRENGTH	pH COMPARISON
A	F ⁻ is stronger than NO ₃ ⁻	Equal pH due to equal concentrations
B	NO ₃ ⁻ stronger than F ⁻	HF has higher pH
C	F ⁻ is weaker than NO ₃ ⁻	HNO ₃ results in lower pH
D	F ⁻ is stronger than NO ₃ ⁻	Solution has lower pH due to HNO ₃

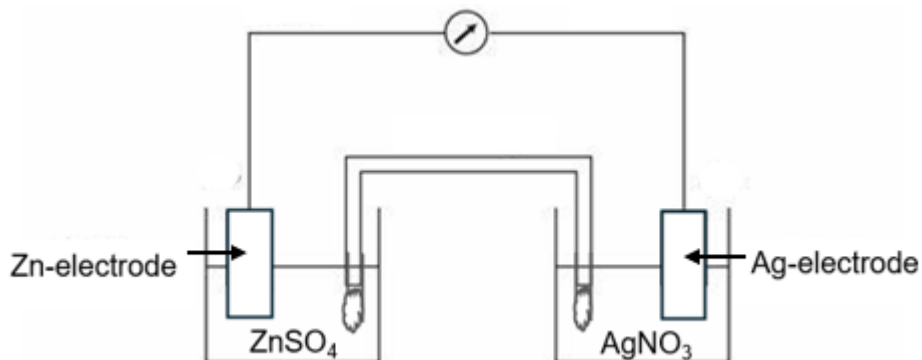
(2)

- 1.8 Which ONE of following best explains the ionization and conductivity of sulphuric acid (H₂SO₄)?

	IONIZATION	CONDUCTIVITY
A	Completely	Does not conduct electricity
B	Incompletely	Conducts electricity
C	Completely	Conducts electricity
D	Incompletely	Does not conduct electricity

(2)

- 1.9 The simplified diagram of a galvanic cell is given below.



Choose the option that best describes the electron flow and the change in the mass of electrodes during the operation of this cell.

	ELECTRON FLOW	Zn ELECTRODE MASS	Ag ELECTRODE MASS
A	From Zn to Ag	Increases	Decreases
B	From Zn to Ag	Decreases	Increases
C	From Ag to Zn	Decreases	Increases
D	From Zn to Ag	Increases	Increases

(2)



1.10 An electrolytic cell is used to re-electroplate a silver spoon with silver metal.

What is the role of silver in this process?

- A It acts as the cathode, where silver ions are reduced to form Ag^+ ions.
- B It acts as the electrolyte, maintaining ionic balance in the solution.
- C It acts as the anode, where silver metal is oxidized to form Ag^+ ions.
- D It is inert and does not participate in the reaction.

(2)

[20]



QUESTION 2 (Start on a new page)

Consider the organic compounds represented by the letters **A** to **H** below:

A	$ \begin{array}{c} \text{H} \\ \\ \text{H} - \text{C} - \text{C} = \text{C} - \text{H} \\ \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \end{array} $	B	$\text{CH}_3\text{CH}_2\text{COOCH}_3$
C	Hept-1-ene	D	$ \begin{array}{cccc} \text{H} & \text{F} & \text{Br} & \text{H} \\ & & & \\ \text{H} - \text{C} - & \text{C} - & \text{C} - & \text{C} - \text{H} \\ & & & \\ \text{H} & \text{F} & & \text{H} \\ & & & \\ & & \text{H} - \text{C} - \text{H} \\ & & & \\ & & \text{H} & \end{array} $
E	CH_3CCH	F	$ \begin{array}{cccc} \text{H} & \text{H} & \text{H} & \text{H} \\ & & & \\ \text{H} - \text{C} - & \text{C} - & \text{C} - & \text{C} - \text{H} \\ & & & \\ \text{H} & \text{H} & \text{H} & \text{H} \end{array} $
G	$ \begin{array}{ccc} \text{H} & \text{O} & \text{H} \\ & & \\ \text{H} - \text{C} - & \text{C} - & \text{C} - \text{H} \\ & & \\ \text{H} & & \text{H} \end{array} $	H	$\text{CH}_3(\text{CH}_2)_3\text{OH}$

2.1 Write down the LETTER that represents EACH of the following:

2.1.1 An alkyl halide. (1)

2.1.2 A ketone. (1)

2.1.3 The product formed from the reaction when propan-1-ol is heated with concentrated sulfuric acid. (2)



2.2 Write down the:

2.2.1 NAME of the homologous series of compound **B**. (2)

2.2.2 IUPAC name of compound **D**. (3)

2.2.3 STRUCTURAL FORMULA of the FUNCTIONAL GROUP of compound **E**. (1)

2.3 Write down the:

2.3.1 NAME of the FUNCTIONAL GROUP of compound **G**. (1)

2.3.2 STRUCTURAL FORMULA of compound **C**. (2)

2.4 Write down the CONDENSED STRUCTURAL FORMULA for the product that will be formed if compound **C** reacts with bromine gas (Br_2). (2)

2.5 Is compound **H** a PRIMARY, SECONDARY or TERTIARY alcohol?
Give a reason for the answer. (2)

2.6 Write down the balanced chemical equation, using MOLECULAR FORMULAE, for the complete combustion of compound **F**. (3)

[20]



QUESTION 3 (Start on a new page)

The boiling points and melting points of the following straight chain ALCOHOLS are investigated. The table below shows the results obtained.

	ORGANIC COMPOUND	BOILING POINT (°C)	MELTING POINT (°C)
A	CH ₃ OH	64,7	-97,6
B	CH ₃ CH ₂ OH	78,37	-114,1
C	CH ₃ (CH ₂) ₂ OH	97,2	-126,0
D	CH ₃ (CH ₂) ₃ OH	117,7	-89,2

- 3.1 Define the term *boiling point*. (2)
- 3.2 Using the data in the table, draw a line graph, on the attached graph paper on page 18, to show the relationship between the number of carbon atoms in each alcohol's chain and its boiling point. (3)
- 3.3 Use your graph to draw a possible conclusion for this investigation. (2)
- 3.4 The melting point of compound **B** is now compared with the melting point of propan-2-ol.

ORGANIC COMPOUND	MELTING POINT (°C)
CH ₃ CH ₂ OH	-114,1
Propan-2-ol	X

The melting point, **X**, of propan-2-ol is given as either -89 °C OR -120 °C.

- 3.4.1 Choose which value is the best possible melting point of propan-2-ol. (2)
- 3.4.2 Explain the answer to QUESTION 3.4.1 by referring to the intermolecular forces of the compounds. (3)

[12]



QUESTION 4 (Start on a new page)

Consider the following organic reactions, **I**, **II** and **III**, and answer the questions that follow.

I	Hex-1-ene + $\text{HCl} \rightarrow$ Organic compound P
II	Organic compound P + $\text{KOH} \rightarrow$ Organic compound Q + KCl
III	Organic compound P + $\text{NaOH} \rightarrow$ Organic compound R + $\text{NaCl} + \text{H}_2\text{O}$

4.1 Consider reaction **I**.

Identify the type of addition reaction. (1)

4.2 Write down the IUPAC NAME of organic compound **P**. (2)

4.3 Consider reaction **II**.

4.3.1 Using STRUCTURAL FORMULAE for the organic compounds, write down a balanced chemical equation for the reaction. (4)

4.3.2 Write down TWO conditions needed for this reaction to take place. (2)

4.4 Consider reaction **III**.

Identify the type of elimination reaction. (1)

4.5 Hex-1-ene and organic compound **R** are structural isomers.

4.5.1 Define the term *structural isomer*. (2)

4.5.2 What type of structural isomer is hex-1-ene and organic compound **R**?
Choose from CHAIN, POSITIONAL or FUNCTIONAL. (1)



4.6 Consider the acid-catalysed reaction below.



- 4.6.1 Identify the type of reaction above. (1)
- 4.6.2 Write down the FORMULA of the catalyst needed for this reaction to take place. (1)
- 4.6.3 Write down the NAME of the inorganic compound. (1)
- 4.6.4 Write the STRUCTURAL FORMULA and IUPAC NAME of compound T. (3)
- 4.6.5 Write down the IUPAC NAME of the functional isomer of compound T. (1)

[20]



QUESTION 5 (Start on a new page)

A group of learners investigate the rate of reaction between **X** g calcium carbonate, (CaCO_3) powder and hydrochloric acid (HCl) according to the balanced equation below.



The mass of the CaCO_3 is measured every 10 seconds. They record their results in the following table.

Time (s)	0	10	20	30	40	50	60	70	80
Mass CaCO_3 (g)	X	74	63	54	46	42	40	40	40

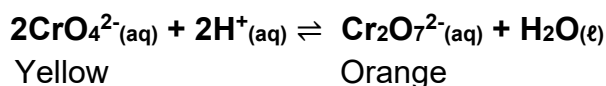
- 5.1 Define the term *rate of reaction*. (2)
- 5.2 Which reactant, calcium carbonate or hydrochloric acid, according to the above table, is in EXCESS? Give a reason for the answer. (2)
- 5.3 The average rate of the reaction in the first 30 seconds is $-1,07 \text{ g.s}^{-1}$.
Calculate the initial mass, **X**, of calcium carbonate. (4)
- 5.4 What volume of CO_2 (in dm^3) is produced between 60 and 80 seconds? (1)
- 5.5 Use the *collision theory* to explain why the average rate of reaction between the powdered calcium carbonate and hydrochloric acid decreases over time. (3)
- 5.6 How will the rate of reaction for the above reaction be affected if the following factors are changed.
Choose from INCREASE, DECREASE or REMAIN THE SAME.
- 5.6.1 The initial mass of calcium carbonate is doubled. (1)
- 5.6.2 The concentration of hydrochloric acid is increased. (1)

[14]



QUESTION 6 (Start on a new page)

- 6.1 Potassium chromate (K_2CrO_4) is dissolved in water. The chromate-ions (CrO_4^{2-}) in the solution is in equilibrium with the dichromate-ions ($\text{Cr}_2\text{O}_7^{2-}$) according to the following balanced equation:



6.1.1 Define the term *chemical equilibrium*. (2)

6.1.2 A few drops of concentrated hydrochloric acid, HCl (conc), are added to the equilibrium mixture.

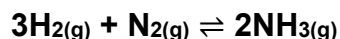
What will be the immediate observable colour change? (2)

6.1.3 Which ion, chromate-ion or dichromate-ion, will have a higher concentration at a low pH? (1)

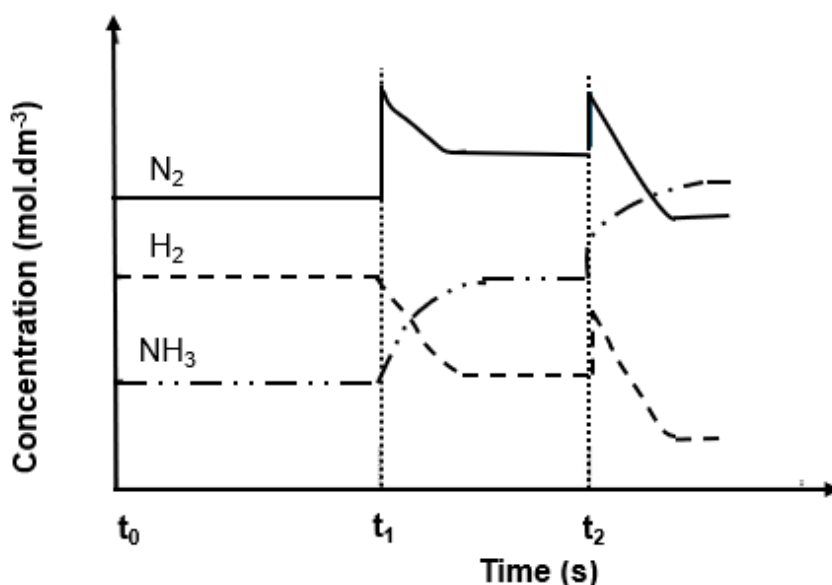
6.1.4 The temperature of the mixture is now gradually increased, the colour of the solution changes to yellow.

Is the forward reaction ENDOTHERMIC or EXOTHERMIC? (1)

- 6.2 The preparation of ammonia (NH_3) from nitrogen (N_2) and hydrogen (H_2) gases is represented as follows:



Changes to the conditions of equilibrium are made at different times. The graph shows the results obtained.





- 6.2.1 State *Le Chatelier's Principle* in words. (2)
- 6.2.2 What change was made to the equilibrium mixture at t_1 ? (1)
- 6.2.3 At t_2 the pressure is adjusted by changing the volume of the container.
Was the pressure INCREASED or DECREASED? (1)
- 6.2.4 Use Le Chatelier's Principle to explain how the system reacts to the disturbance in QUESTION 6.2.3. (3)
- 6.2.5 Initially 126 g of nitrogen gas (N_2) and an unknown mass of hydrogen gas (H_2) is sealed in a 500 cm^3 container. At equilibrium, the concentration of the nitrogen gas is $3\text{ mol}\cdot\text{dm}^{-3}$. The K_c value for this reaction is 0,22.
Calculate the mass of hydrogen gas initially used. (8)

[21]



QUESTION 7 (Start on a new page)

7.1 A solution of diluted sulphuric acid (H_2SO_4) has a concentration of $0,25 \text{ mol} \cdot \text{dm}^{-3}$.

7.1.1 Define an acid in terms of the Arrhenius theory. (2)

7.1.2 Is sulphuric acid a WEAK or a STRONG acid? (1)

7.1.3 Explain the answer to QUESTION 7.1.2. (2)

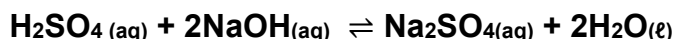
7.1.4 Write down the FORMULA of the conjugate base of sulphuric acid. (1)

7.2 A $0,10 \text{ mol} \cdot \text{dm}^{-3}$ solution of sodium ethanoate (CH_3COONa) is prepared at 25°C .

7.2.1 Define the term *hydrolysis*. (2)

7.2.2 Write a balanced equation for the hydrolysis of ethanoate ion. (3)

7.3 A learner adds 24 cm^3 of the original sulphuric acid solution (as in QUESTION 7.1) to **X** cm^3 sodium hydroxide (NaOH) solution with a concentration of $0,15 \text{ mol} \cdot \text{dm}^{-3}$. The balanced equation for this reaction is:



The pH of the solution that forms is 0,65.

7.3.1 Calculate the concentration of the sulphuric acid solution after it has reacted with sodium hydroxide. (4)

7.3.2 Calculate the initial volume (**X**) of the sodium hydroxide solution. (8)

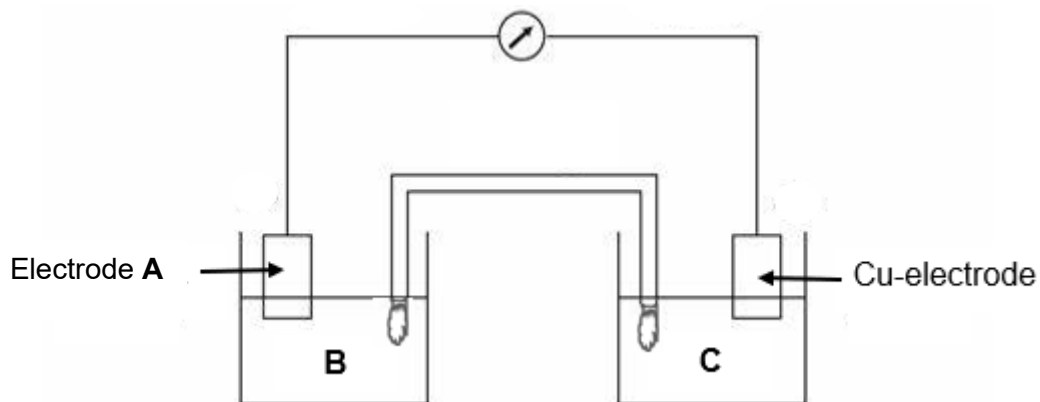
[23]



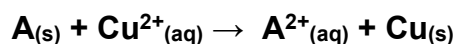
QUESTION 8 (Start on a new page)

A galvanic cell is constructed to operate under standard conditions.

The cell set up is shown in the simplified diagram below.



The nett cell reaction is given by the following equation:



The following cell potentials are measured:

CONDITION	$[\text{Cu}^{2+}]$ ($\text{mol} \cdot \text{dm}^{-3}$)	$[\text{A}^{2+}]$ ($\text{mol} \cdot \text{dm}^{-3}$)	E^{θ}_{cell} (V)
i	1,0	1,0	+0,78
ii	0,001	1,0	+0,69
iii	1,0	0,010	+0,84

8.1 Identify the unknown metal **A**. (4)

8.2 Explain the effect on cell potential if the concentration of A^{2+} is increased from $1 \text{ mol} \cdot \text{dm}^{-3}$ to $2 \text{ mol} \cdot \text{dm}^{-3}$. (3)

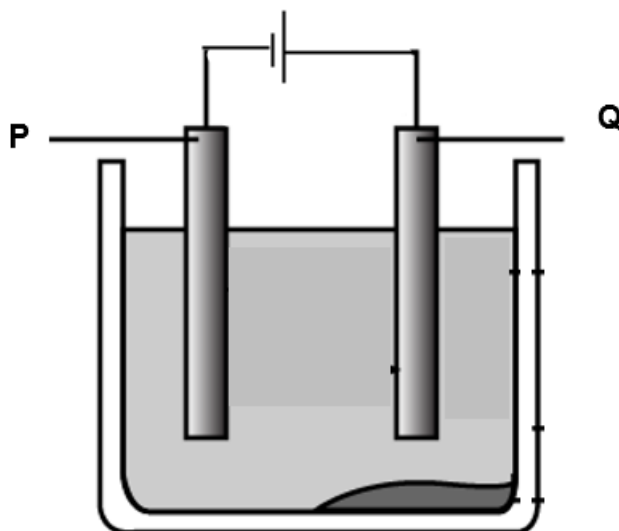
8.3 Would the reaction be spontaneous? Choose from YES or NO.
Give a reason for the answer. (2)

[9]



QUESTION 9 (Start on a new page)

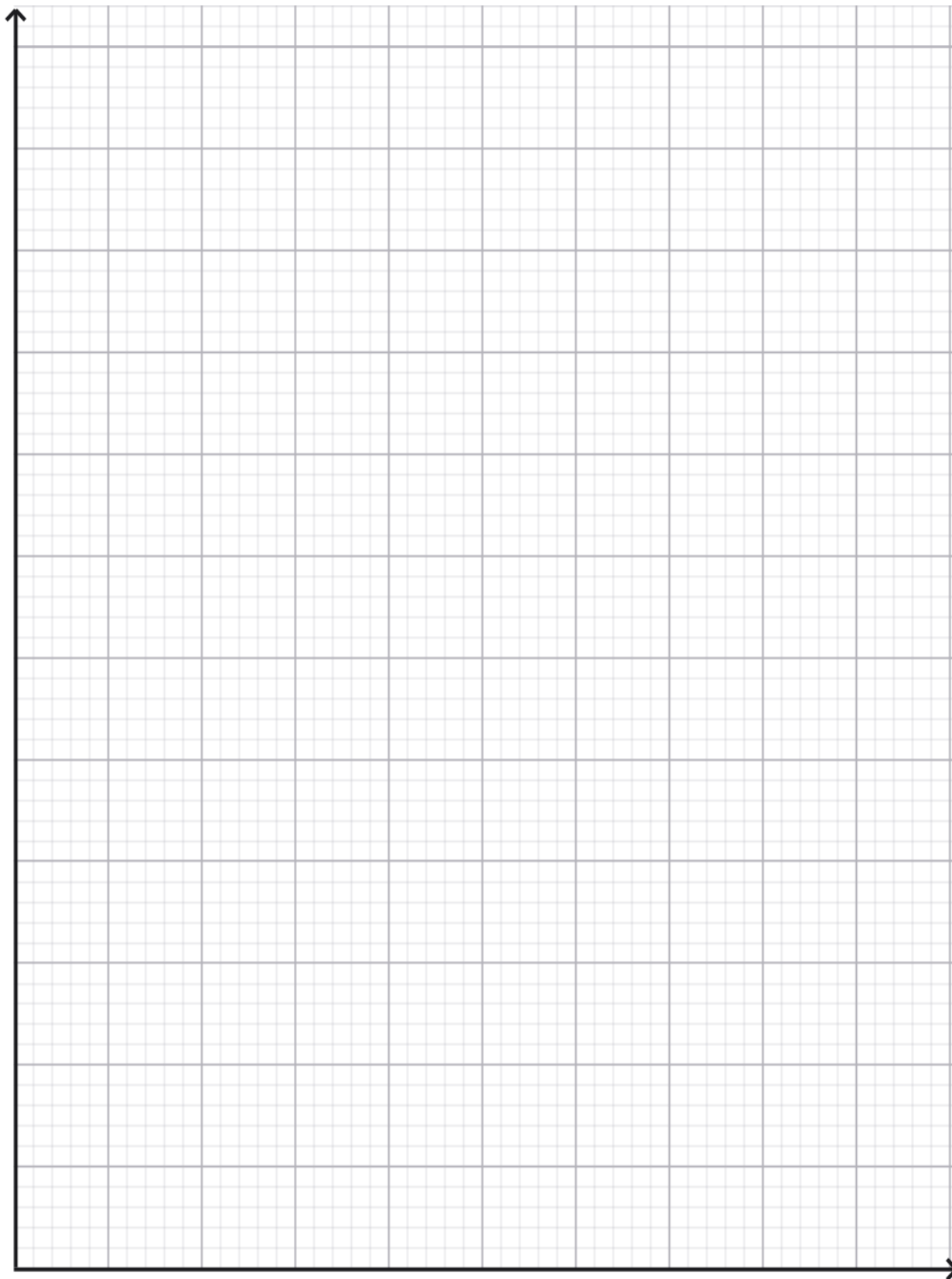
The diagram below shows an electrochemical cell used to purify copper. A solution that conducts electricity is used in the cell. The impure copper electrode contains silver (Ag), and platinum (Pt).



- 9.1 What energy conversion takes place in this cell? (1)
- 9.2 Write down ONE word for the underlined phrase above the diagram. (1)
- 9.3 Which electrode (**P** or **Q**) is the cathode? (1)
- 9.4 Which elements would you expect to be in the precipitate that forms on the bottom of the cell? (2)
- 9.5 Calculate the mass of copper deposited on the cathode if a current of 2 A is passed through the solution for 8 hours. (6)

[11]

GRAND TOTAL: [150]

**QUESTION 3.2.****STUDENT NUMBER:** _____



DATA SHEET FOR PHYSICAL SCIENCES
INLIGTINGSBLAD VIR FISIIESE WETENSKAPPE
PAPER 2 (CHEMISTRY)
VRAESTEL 2 (CHEMIE)

TABLE 1: PHYSICAL CONSTANTS / TABEL 1: FISIIESE KONSTANTES

NAME / NAME	SYMBOL / SIMBOOL	VALUE / WAARDE
Standard pressure <i>Standaarddruk</i>	p^{θ}	$1,013 \times 10^5 \text{ Pa}$
Molar gas volume at STP <i>Molêre gasvolume by STD</i>	V_m	$22,4 \text{ dm}^3 \cdot \text{mol}^{-1}$
Standard temperature <i>Standaardtemperatuur</i>	T^{θ}	273 K
Charge on electron <i>Lading op 'n elektron</i>	e	$-1,6 \times 10^{-19} \text{ C}$
Avogadro's constant <i>Avogadro se konstante</i>	N_A	$6,02 \times 10^{23} \text{ mol}^{-1}$

TABLE 2: FORMULAE / TABEL 2: FORMULE

$n = \frac{m}{M}$	$n = \frac{N}{N_A}$
$c = \frac{n}{V}$ or/of $c = \frac{m}{MV}$	$n = \frac{V}{V_m}$
$\frac{c_a V_a}{c_b V_b} = \frac{n_a}{n_b}$	$\text{pH} = -\log[\text{H}_3\text{O}^+]$
$K_w = [\text{H}_3\text{O}^+][\text{OH}^-] = 1 \times 10^{-14} \text{ at/by } 298 \text{ K}$	
$E_{\text{cell}}^{\theta} = E_{\text{cathode}}^{\theta} - E_{\text{anode}}^{\theta} / E_{\text{sel}}^{\theta} = E_{\text{katode}}^{\theta} - E_{\text{anode}}^{\theta}$ or/of $E_{\text{cell}}^{\theta} = E_{\text{reduction}}^{\theta} - E_{\text{oxidation}}^{\theta} / E_{\text{sel}}^{\theta} = E_{\text{reduksie}}^{\theta} - E_{\text{oksidasie}}^{\theta}$ or/of $E_{\text{cell}}^{\theta} = E_{\text{oxidising agent}}^{\theta} - E_{\text{reducing agent}}^{\theta} / E_{\text{sel}}^{\theta} = E_{\text{oksideermiddel}}^{\theta} - E_{\text{reduseermiddel}}^{\theta}$	
$I = \frac{Q}{\Delta t}$	$n = \frac{Q}{q_e}$ where n is the number of electrons/ waar n die aantal elektrone is



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	KEY/SLEUTEL Atomic number <i>Atoomgetal</i> Electronegativity <i>Elektronegatiwiteit</i> Symbol <i>Simbool</i> Approximate relative atomic mass <i>Benaderde relatiewe atoommassa</i> 29 Cu 63,5											5 B 11	6 C 12	7 N 14	8 O 16	9 F 19	10 Ne 20	
1,0 3 Li 7	1,5 4 Be 9												13 Al 27	14 Si 28	15 P 31	16 S 32	17 Cl 35,5	18 Ar 40
0,9 11 Na 23	1,2 12 Mg 24	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		

KEY/SLEUTEL

Atomic number

Atoomgetal

Electronegativity
Elektronegatiwiteit

1,9

29

Cu

63,5

Symbol
Simbool

Approximate relative atomic mass / Benaderde relatiewe atoommassa



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

Half-reactions/ <i>Half-reaksies</i>	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
$Cl_2(g) + 2e^- \rightleftharpoons 2Cl^-$	+ 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
$Br_2(l) + 2e^- \rightleftharpoons 2Br^-$	+ 1,07
$NO_3^- + 4H^+ + 3e^- \rightleftharpoons NO(g) + 2H_2O$	+ 0,96
$Hg^{2+} + 2e^- \rightleftharpoons Hg(l)$	+ 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
$Al^{3+} + 3e^- \rightleftharpoons Al$	- 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: STANDAARDREDUKSIEPOTENSIALE

Half-reactions/ <i>Half-reaksies</i>	E^{θ} (V)
$\text{Li}^{+} + \text{e}^{-} \rightleftharpoons \text{Li}$	-3,05
$\text{K}^{+} + \text{e}^{-} \rightleftharpoons \text{K}$	-2,93
$\text{Cs}^{+} + \text{e}^{-} \rightleftharpoons \text{Cs}$	-2,92
$\text{Ba}^{2+} + 2\text{e}^{-} \rightleftharpoons \text{Ba}$	-2,90
$\text{Sr}^{2+} + 2\text{e}^{-} \rightleftharpoons \text{Sr}$	-2,89
$\text{Ca}^{2+} + 2\text{e}^{-} \rightleftharpoons \text{Ca}$	-2,87
$\text{Na}^{+} + \text{e}^{-} \rightleftharpoons \text{Na}$	-2,71
$\text{Mg}^{2+} + 2\text{e}^{-} \rightleftharpoons \text{Mg}$	-2,36
$\text{Al}^{3+} + 3\text{e}^{-} \rightleftharpoons \text{Al}$	-1,66
$\text{Mn}^{2+} + 2\text{e}^{-} \rightleftharpoons \text{Mn}$	-1,18
$\text{Cr}^{2+} + 2\text{e}^{-} \rightleftharpoons \text{Cr}$	-0,91
$2\text{H}_2\text{O} + 2\text{e}^{-} \rightleftharpoons \text{H}_2(\text{g}) + 2\text{OH}^{-}$	-0,83
$\text{Zn}^{2+} + 2\text{e}^{-} \rightleftharpoons \text{Zn}$	-0,76
$\text{Cr}^{3+} + 3\text{e}^{-} \rightleftharpoons \text{Cr}$	-0,74
$\text{Fe}^{2+} + 2\text{e}^{-} \rightleftharpoons \text{Fe}$	-0,44
$\text{Cr}^{3+} + \text{e}^{-} \rightleftharpoons \text{Cr}^{2+}$	-0,41
$\text{Cd}^{2+} + 2\text{e}^{-} \rightleftharpoons \text{Cd}$	-0,40
$\text{Co}^{2+} + 2\text{e}^{-} \rightleftharpoons \text{Co}$	-0,28
$\text{Ni}^{2+} + 2\text{e}^{-} \rightleftharpoons \text{Ni}$	-0,27
$\text{Sn}^{2+} + 2\text{e}^{-} \rightleftharpoons \text{Sn}$	-0,14
$\text{Pb}^{2+} + 2\text{e}^{-} \rightleftharpoons \text{Pb}$	-0,13
$\text{Fe}^{3+} + 3\text{e}^{-} \rightleftharpoons \text{Fe}$	-0,06
$2\text{H}^{+} + 2\text{e}^{-} \rightleftharpoons \text{H}_2(\text{g})$	0,00
$\text{S} + 2\text{H}^{+} + 2\text{e}^{-} \rightleftharpoons \text{H}_2\text{S}(\text{g})$	+0,14
$\text{Sn}^{4+} + 2\text{e}^{-} \rightleftharpoons \text{Sn}^{2+}$	+0,15
$\text{Cu}^{2+} + \text{e}^{-} \rightleftharpoons \text{Cu}^{+}$	+0,16
$\text{SO}_4^{2-} + 4\text{H}^{+} + 2\text{e}^{-} \rightleftharpoons \text{SO}_2(\text{g}) + 2\text{H}_2\text{O}$	+0,17
$\text{Cu}^{2+} + 2\text{e}^{-} \rightleftharpoons \text{Cu}$	+0,34
$2\text{H}_2\text{O} + \text{O}_2 + 4\text{e}^{-} \rightleftharpoons 4\text{OH}^{-}$	+0,40
$\text{SO}_2 + 4\text{H}^{+} + 4\text{e}^{-} \rightleftharpoons \text{S} + 2\text{H}_2\text{O}$	+0,45
$\text{Cu}^{+} + \text{e}^{-} \rightleftharpoons \text{Cu}$	+0,52
$\text{I}_2 + 2\text{e}^{-} \rightleftharpoons 2\text{I}^{-}$	+0,54
$\text{O}_2(\text{g}) + 2\text{H}^{+} + 2\text{e}^{-} \rightleftharpoons \text{H}_2\text{O}_2$	+0,68
$\text{Fe}^{3+} + \text{e}^{-} \rightleftharpoons \text{Fe}^{2+}$	+0,77
$\text{NO}_3^{-} + 2\text{H}^{+} + \text{e}^{-} \rightleftharpoons \text{NO}_2(\text{g}) + \text{H}_2\text{O}$	+0,80
$\text{Ag}^{+} + \text{e}^{-} \rightleftharpoons \text{Ag}$	+0,80
$\text{Hg}^{2+} + 2\text{e}^{-} \rightleftharpoons \text{Hg}(\ell)$	+0,85
$\text{NO}_3^{-} + 4\text{H}^{+} + 3\text{e}^{-} \rightleftharpoons \text{NO}(\text{g}) + 2\text{H}_2\text{O}$	+0,96
$\text{Br}_2(\ell) + 2\text{e}^{-} \rightleftharpoons 2\text{Br}^{-}$	+1,07
$\text{Pt}^{2+} + 2\text{e}^{-} \rightleftharpoons \text{Pt}$	+1,20
$\text{MnO}_2 + 4\text{H}^{+} + 2\text{e}^{-} \rightleftharpoons \text{Mn}^{2+} + 2\text{H}_2\text{O}$	+1,23
$\text{O}_2(\text{g}) + 4\text{H}^{+} + 4\text{e}^{-} \rightleftharpoons 2\text{H}_2\text{O}$	+1,23
$\text{Cr}_2\text{O}_7^{2-} + 14\text{H}^{+} + 6\text{e}^{-} \rightleftharpoons 2\text{Cr}^{3+} + 7\text{H}_2\text{O}$	+1,33
$\text{Cl}_2(\text{g}) + 2\text{e}^{-} \rightleftharpoons 2\text{Cl}^{-}$	+1,36
$\text{MnO}_4^{-} + 8\text{H}^{+} + 5\text{e}^{-} \rightleftharpoons \text{Mn}^{2+} + 4\text{H}_2\text{O}$	+1,51
$\text{H}_2\text{O}_2 + 2\text{H}^{+} + 2\text{e}^{-} \rightleftharpoons 2\text{H}_2\text{O}$	+1,77
$\text{Co}^{3+} + \text{e}^{-} \rightleftharpoons \text{Co}^{2+}$	+1,81
$\text{F}_2(\text{g}) + 2\text{e}^{-} \rightleftharpoons 2\text{F}^{-}$	+2,87

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