education

Department:
Education
North West Provincial Government
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE
NASIONALE SENIOR SERTIFIKAAT

GRADE/*GRAAD* 12

PHYSICAL SCIENCES: CHEMISTRY (P2)
FISIESE WETENSKAPPE: CHEMIE (V2)

SEPTEMBER 2026

MARKING GUIDELINES/*NASIENRIGLYNE*

MARKS/*PUNTE*: 150

These marking guidelines consist of 14 pages.
Hierdie nasienriglyne bestaan uit 14 bladsye.

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QUESTION/*VRAAG* 1

1.1.	C	✓✓	(2)
1.2	A	✓✓	(2)
1.3	C	✓✓	(2)
1.4	B	✓✓	(2)
1.5	D	✓✓	(2)
1.6	B	✓✓	(2)
1.7	A	✓✓	(2)
1.8	A	✓✓	(2)
1.9	B	✓✓	(2)
1.10	D	✓✓	(2)

[20]

QUESTION/*VRAAG* 2

2.1 Organic molecules with the same molecular formula, ✓but different functional groups. ✓
Organiese molekule met dieselfde molekulêre formule, maar verskillende funksionele groepe. (2)

2.2 A ✓and C✓/ *A en C* (2)

2.3 Formyl✓group/*Formiel groep* (1)

2.4 Secondary.✓ The carbon bonded to the hydroxyl group(-OH) is bonded to 2 other carbon atoms/the functional group is bonded to 2 other carbon atoms.✓
Sekondêr. Die koolstofatoom waaraan die hidroksielgroep(-OH) gebind is, is aan twee ander koolstofatome gebind/die funksionele groep is gebind aan twee ander koolstofatome. (2)

2.5

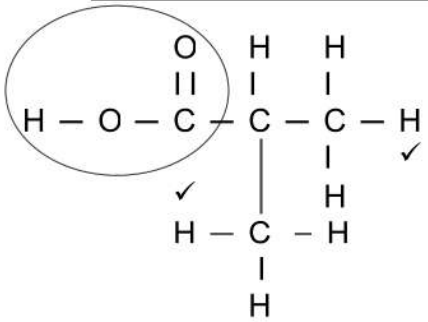
2.5.1 But-1-yne ✓✓ / *But-1-yn* (2)

2.5.2 2,4-difluoro-3,3-dimethylpentane✓✓✓
2,4-difluoro-3,3-dimetielpentaan (3)

Marking criteria:
- Correct stem i.e. pentane.✓
- All substituents (difluoro and dimethyl) correctly identified.✓
- IUPAC name completely correct including numbering, sequence, hyphens and commas. ✓

Nasienkriteria:
- *Korrekte stam d.i. pentaan* ✓
- *Alle substituente(difluoro en dimetiel) korrek geïdentifiseer* ✓
- *IUPAC naam heeltemal korrek insluitende nommering, volgorde, koppeltekens en kommas.* ✓

2.5.3



Marking criteria:
- Functional group✓
- Whole structure correct✓

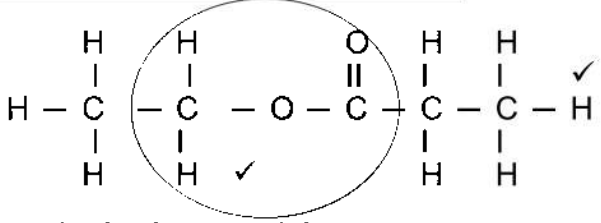
Nasienkriteria:
- *Funksionele groep* ✓
- *Hele struktuur korrek* ✓

(2)

2.5.4

Marking criteria:
- Functional group✓
- Whole structure correct ✓

Nasienkriteria:
- *Funksionele groep* ✓
- *Hele struktuur korrek* ✓



(2)

2.5.5 $CH_3CHOHCH_2CH_3$✓✓ (2)

[18]

QUESTION/*VRAAG* 3

3.1 The temperature at which the vapour pressure of a substance equals atmospheric pressure✓✓
Die temperatuur waarby die dampdruk van 'n stof gelyk is aan die atmosferiese druk.

Marking criteria/*Nasienkriteria:*
If any one of the underlined key phrases in the **correct context** is omitted, deduct 1 mark./*Indien enige van die onderstreepte frases in die korrekte konteks uitgelaat is, trek 1 punt af.*

(2)

3.2 72 ($g.mol^{-1}$) ✓ (1)

3.3.1 Higher than✓/Hoër as (1)

3.3.2 From B to A
- **Structure:**
  The chain length increases✓.
- **Intermolecular forces:**
  The strength of the London forces/induced dipole/Van der Waals/ intermolecular forces increase. ✓
- **Energy:**
  More energy needed to overcome/break the intermolecular forces.✓

OR

From A to B
- **Structure:**
  The chain length decreases.✓
- **Intermolecular forces:**
  The strength of the London forces/induced dipole/Van der Waals/ intermolecular forces decrease✓
- **Energy:**
  Lesser energy needed to overcome/break the intermolecular forces.✓

Van B na A
- ***Struktuur:***
  Die kettinglengte neem toe.✓
- ***Intermolekulêre kragte:***
  Die sterkte van die Londonkragte/geïnduseerde dipool/Van der Waals/intermolekulêre kragte neem toe.✓
- ***Energie:***
  Meer energie word benodig om die intermolekulêre kragte te oorkom/breek.✓

OF

Van A na B (3)

- ***Struktuur:***
  Die kettinglengte neem af. ✓
- ***Intermolekulêre kragte:***
  Die sterkte van die Londonkragte/geïnduseerde dipool/Van der Waals/intermolekulêre kragte neem af. ✓
- ***Energie:***
  Minder energie word benodig om die intermolekulêre kragte te oorkom/breek. ✓

3.4.1 D/propanoic acid/*propanoësuur* ✓✓ (2)

3.4.2
- Boiling point of D is higher than C/ Boiling point of C is lower than D✓
- Compound D/propanoic acid/carboxylic acid has two sites of hydrogen bond. Compound C/alcohol/1-butanol has one site of hydrogen bond. ✓
- Intermolecular forces in compound D/ propanoic acid/carboxylic acid are stronger than the intermolecular forces in alcohols ✓
  OR
  Intermolecular forces in C/alcohol/1-butanol are weaker than in compound D
- More energy needed to overcome/break the intermolecular forces in D/propanoic acid/carboxylic acid than in compound C/alcohol/1-butanol.✓
  OR
  Less energy needed to overcome/break the intermolecular forces in C/alcohol/1-butanol than in D/propanoic acid/carboxylic acid.
- *Kookpunt van D is hoër as C/Koopunt van C is laer as D.*
- *Verbinding D/propanoësuur/karboksielsuur het twee plekke vir waterstofbinding. Verbinding C/1-butanol/alkohol het een plek vir waterstofbinding.*
- *Intermolekulêre kragte in D/propanoësuur/karboksielsuur is sterker as die intermolekulêre kragte in C/alkohol/1-butanol.*
  OF
- *Intermolekulêre kragte in C/alkohol/butanol is swakker as in D/propanoësuur/karboksielsuur.*
- *Meer energie word benodig om die intermolekulêre kragte in D/propanoësuur/karboksielsuur te oorkom/breek as die intermolekulêre kragte in C/alkohol/1-butanol.*
  OF
- *Minder energie word benodig om die intermolekulêre kragte in C/alkohol/butanol te oorkom/breek as die intermolekulêre kragte in D/propanoësuur/karboksielsuur.*

(4)
[13]

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QUESTION/*VRAAG* 4

4.1.1 Elimination✓/*Eliminasie* (1)

4.1.2 Concentrated strong base/KOH✓/ *Gekonsentreerde sterk basis/KOH* (1)

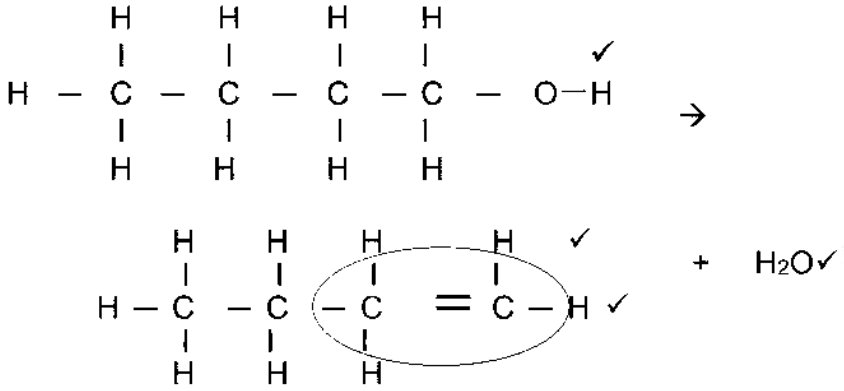
4.2.1 Hydrolysis (reaction)✓/*Hidrolise (reaksie)* (1)

4.2.2 KCℓ ✓and H_2O ✓/ *KCℓ ✓en H_2O ✓* (2)

4.3

Marking criteria:
- Correct structural formula for butanol ✓
- Functional group of alkene is correct✓
- The whole structural formula is correct ✓
- H_2O ✓

Nasienkriteria:
- *Korrekte struktuurformule vir butanol*
- *Funksionele groep van alkeen is korrek*
- *Die hele struktuurformule is korrek*
- *H_2O*



(4)

4.4.1 Platinum or Pt/Paladium or Pd/Nickel/Nikkel or Ni✓ (1)

4.4.2 Butane✓✓/*Butaan* (2)

4.4.3 $2\underline{C_4H_{10}} + 13O_2 \rightarrow \underline{8CO_2} + \underline{10H_2O}$ (Bal) ✓ (3)

4.5.1 Esterification✓/*Esterfikasie* (1)

4.5.2

Marking criteria:

- Correct condensed structural formula for butanol ✓
- Correct condensed structural formula for propanoic acid ✓
- Functional group of ester is correct✓
- The whole condensed structural formula is correct ✓
- H_2O ✓

IF

- Any additional reactants or products: Deduct 1 mark
- Structural formulae used. Max. ($^4/_5$)
- Molecular formulae used. Max. ($^1/_5$)
- Only reactants without arrow Max. ($^2/_5$) : Marking rule 6.3.10

Nasienkriteria:

- *Korrekte gekondenseerde struktuurformule vir butanol* ✓
- *Korrekte gekondenseerde struktuurformule vir propanoësuur* ✓
- *Funksionele groep van die ester is korrek*✓
- *Die hele gekondenseerde struktuurformule is korrek* ✓
- *H_2O* ✓

INDIEN

- *Enige addisionele reaktanse of produkte: Trek 1 punt af*
- *Struktuurformules gebruik. Maks.* ($^4/_5$)
- *Molekulêre formules gebruik. Maks.* ($^1/_5$)
- *Slegs reaktanse sonder pyl Maks.* ($^2/_5$) *: Nasienreël 6.3.10*

✓ ✓ ✓ ✓ ✓

$CH_3CH_2CH_2CH_2OH + CH_3CH_2COOH \rightarrow CH_3CH_2COOCH_2CH_2CH_2CH_3 + H_2O$

OR/*OF*

✓ ✓ ✓ ✓

$CH_3CH_2CH_2CH_2OH + CH_3CH_2COOH \rightarrow CH_3CH_2C(=O)OCH_2CH_2CH_2CH_3 + H_2O$

(5)

[21]

QUESTION/*VRAAG* 5

5.1

ANY ONE*:*

- Change in concentration ✓of products/reactants per unit time.✓
- Change in amount/number of mole/volume/mass ✓of products/reactants per unit time.✓
- Amount/number of mole/volume/mass of products formed/reactants used✓ per unit time.✓
- Rate of change in concentration/amount of moles/number of moles/volume/mass.✓✓(**2 or 0**)

ENIGE EEN:

- *Verandering in konsentrasie ✓van produkte/reaktante per eenheidtyd.*✓
- *Verandering in hoeveelheid/getal mol/volume/massa ✓van die produkte/reaktante per eenheidtyd.*✓
- *Hoeveelheid/getal mol/volume/massa van die produkte gevorm/reaktante gebruik*✓ *per eenheidtyd.*✓
- *Tempo van verandering in konsentrasie/hoeveelheid mol/getal mol/volume/massa.*✓✓*(**2 or 0**)*

NOTE/*NOTA*

Give the mark for per unit time only if in correct context of reaction rate

Gee die punt vir per eenheidtyd slegs in die korrekte konteks van reaksietempo

(2)

5.2 As concentration increases rate also increases. ✓
Soos die konsentrasie toeneem sal die reaksietempo ook toeneem. (1)

5.3
- Amount of particles per unit volume increases✓
- More effective collision per unit time/second/Higher frequency of effective collisions ✓
- *Hoeveelheid deeltjies per volume-eenheid neem toe*
- *Meer effektiewe botsings per eenheidtyd/sekonde/hoër frekwensie van effektiewe botsings* (2)

5.4.1

Marking criteria/*Nasienkriteria*:
- Ratio of HCℓ and H_2/*Verhouding HCℓ and H_2 is* 2:1 ✓
- Answer/*Antwoord* 1,08 x 10^{-1}($mol \cdot dm^{-3} \cdot s^{-1}$) ✓

$HC\ell : H_2$
2 : 1✓
x : 5,4 x 10^{-2}
Rate/*tempo* = 1,08 x 10^{-1} ($mol \cdot dm^{-3} \cdot s^{-1}$) ✓**Accept/Aanvaar** : 0,11 ($mol \cdot dm^{-3} \cdot s^{-1}$) (2)

5.4.2

Marking criteria/*Nasienkriteria*:
- Any Formula/*Enige formule* $n = \frac{m}{M}$ or $c = \frac{n}{V}$ ✓
- Substituting/*Vervanging* 65 $g \cdot mol^{-1}$ ✓in $n = \frac{m}{M}$
- USE ratio/*GEBRUIK verhouding* ✓
- Rate substitution/*Tempo vervanging*✓
- Substitution of/*Vervanging van* $\frac{0,15}{0,162}$✓
- Answer/*Antwoord* 0,949 dm^3✓

$n = \frac{m}{M}$✓
$n = \frac{10}{65}$✓
= 0,1539 mol
$n(H_2)$ = 0,1539 mol ✓

Rate = $\Delta c/\Delta t$
$\Delta c = (5,4 \times 10^{-2})(3)$✓
= 0,162 $mol \cdot dm^{-3}$

$V = \frac{n}{c}$
$V = \frac{0,1539}{0,162}$ ✓
= 0,95 dm^3✓ (6)

5.5.1 Increases✓/*Toeneem* (1)

5.5.2 Increases✓/*Toeneem* (1)

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5.5.3 Surface area/State of division increases/More particles are exposed to HCℓ ✓
More effective collision per unit time ✓
Kontakoppervlak/Toestand van verdeeldheid neemtoe/Meer deeltjies blootgestel aan HCℓ ✓
Meer effektiewe botsings per eenheidtyd ✓ (2)
[17]

QUESTION/*VRAAG* 6

6.1 Reaction in which products can be converted to reactants (and vice versa).✓✓
(**2** or **0)**
Reaksie wanneer produkte terug na reaktanse omgeskakel kan word. (2)

6.2 0,5 (mol)✓ (1)

6.3

CALCULATIONS USING NUMBER OF MOLES/*BEREKENING DEUR MOL TE GEBRUIK*

Marking criteria/*Nasienkriteria*:
a) Equilibrium/*Ewewig* n(XY_3) ✓
b) Using ratio/*Gebruik verhouding*: X_2 : Y_2 : XY_3 = 1: 3: 2✓
c) Equilibrium/*Ewewig* n(X_2) = intial/*aanvanklik* n(X_2) – change/ n(X_2)
Equilibrium n(Y_2) = intial n(Y_2) - change n(Y_2) ✓
d) Dividing/*Deel deur* by 2 ✓
e) Correct K_c expression in square brackets/*Korrekte K_c uitdrukking in vierkantige hakies* ✓
f) Substitution of equilibrium concentrations into K_c expressions✓
Vervanging van ewewigskonsentrasies in die K_c uitdrukking
g) Final answer/*Finale antwoord* 0.0078✓

mol	X_2	$3Y_2$	$2XY_3$
Initial mole/ *Aanvanklike mol*	4	4	0
Change in mole/ *Verandering in mol*	0,25	0,75	0,5 ✓ (b)
Equilibrium mole/ *Ewewigs mol*	3,75	3,25 ✓(c)	0,5 ✓ (a)
Concentration/ *Konsentrasie*	1,875	1,625	0,25 ✓ (d)

✓

$K_c = \frac{[XY_3]^2}{[X_2][Y_2]^3}$ (e)

$K_c = \frac{(0,25)^2}{(1,875)(1,625)^3}$ ✓(f)

K_c = 0,0078 ✓ (g) (7)

6.4.1 Exothermic✓/*Eksotermies* (1)

6.4.2
- The number of moles of X_2 (reactant) increases and the number of moles of XY_3 (product) decreases ✓
- Increase in temperature favours the endothermic reaction ✓
- The reverse reaction is favoured✓
  Die aantal mol X_2 (reaktans) neemtoe en die aantal mol XY_3 (produk) neem af
- *Toename in temperatuur bevoordeel die endotermiese reaksie*
- *Die terugwaartse reaksie word bevoordeel* (3)

6.4.3 Decrease✓/*Afneem* (1)
[15]

QUESTION/*VRAAG 7*

7.1 Ionise incompletely in water to form low concentration of H_3O^+ ions ✓✓ **(2 or 0)**
Ioniseer onvolledig in water om 'n lae konsentrasie H_3O^+ ione te vorm (2)

7.2.1 NaCℓ ✓
It is a salt of strong acid and a strong base/ ✓
Dit is 'n sout van 'n sterk suur en 'n sterk basis (2)

7.2.2 $NH_4Cℓ$ ✓

$NH_4^+ + H_2O \rightarrow NH_3 + H_3O^+$ ✓✓ (3)

7.3

Marking criteria:

- Calculate n (H_2SO_4) using $c = \frac{n}{V}$ ✓
- Calculate n (NaOH) using $c = \frac{n}{V}$ ✓
- Using Ratio 1 : 2 correctly ✓
- Calculate n $(NaOH)_{excess} = n(NaOH)_{initial} - n(NaOH)_{used}$ ✓
- Substitute 0,04 and 0,5 in $c = \frac{n}{V}$ ✓
- Any formula $p^{OH} = -\log[OH^-]$ or $p^H = -\log[H_3O]^+$ ✓
- Substitution in the formula $p^H + p^{OH} = 14$ or $K_w = [H_3O^+][OH^-]$ ✓
- Answer 12,9 ✓

Nasienkriteria:

- *Bereken n (H_2SO_4) using $c = \frac{n}{V}$* ✓
- *Bereken n (NaOH) using $c = \frac{n}{V}$* ✓
- *Gebruik verhouding 1 : 2 korrek* ✓
- *Bereken n $(NaOH)_{oormaat} = n(NaOH)_{aanvanklik} - n(NaOH)_{gebruik}$* ✓
- *Vervang 0,04 en 0,5 in $c = \frac{n}{V}$* ✓
- *Enige formule $pOH = -\log[OH^-]$ of $pH = -\log[H_3O]^+$* ✓
- *Vervanging in die formule $pH + pOH = 14$ of $K_w = [H_3O^+][OH^-]$* ✓
- *Antwoord 12,9* ✓

$n(H_2SO_4) = \frac{0,1 \times 0.3}{}$ ✓
$= 0,03$ mol

$n(NaOH) = \frac{0,5 \times 0,2}{}$ ✓
$= 0,1$ mol

$n(H_2SO_4) : n(NaOH)$
$1 : 2$
$n(NaOH) = 0,06$ mol ✓

$n(excess) = 0,1 - 0,06$ ✓ $= 0,04$ mol

$$c(NaOH) = \frac{n}{V}$$
$$= \frac{0,04}{(0,3 + 0,2)}$$ ✓
$$= 0,08 \text{ mol}$$

$p^{OH} = -\log[OH^-]$ ✓
$p^{OH} = -\log(0,08)$
$p^{OH} = 1,1$
$p^H + p^{OH} = 14$
$p^H + 1,1 = 14$ ✓
$p^H = 14 - 1,1$
$p^H = 12,9$ ✓ (8)

QUESTION/*VRAAG* 8

8.1 Chemical energy is converted to electric energy. ✓✓ **(2 or 0)**
Chemiese energie omgeskakel na elektriese energie (2)

8.2 Fe to Ni/*Fe na Ni*✓ (1)

8.3 Fe is a stronger reducing agent ✓ than Ni. ✓ Ni^{2+} is reduced to Ni/Fe is oxidised to Fe^{2+}.✓
Fe is 'n sterker reduseermiddel na Ni. Ni^{2+} is gereduseer na Ni/Fe is geoksideer na Fe^{2+}. (3)

8.4.1 Decreases✓/*Afneem* (1)

8.4.2 Decreases✓/*Afneem* (1)

8.5 $Fe \rightarrow Fe^{2+} + 2e^-$ ✓✓

NOTE/NOTA:
- $Fe^{2+} + 2e^- \rightleftharpoons Fe$ ($^1/_2$)
- $Fe \leftarrow Fe^{2+} + 2e^-$ ($^2/_2$)
- $Fe \rightleftharpoons Fe^{2+} + 2e$ ($^0/_2$)
- $Fe \rightarrow Fe^{2+}(aq) + 2e^-$ ($^0/_2$)
- Ignore charges omitted on electron/*Ignoreer indien lading weggelaat is op elektron.*
- If charge (+) omitted on Fe^{2+}/ *Indien lading (+) weggelaat is op Fe^{2+}*
  Max. ($^1/_2$)
  Example/*Voorbeeld*: $Fe^2 + 2e^- \rightarrow Fe$ ✓
- Ignore phases/*Ignoreer fases*

(2)

8.6 $Fe + Ni^{2+}$ ✓→ $Ni + Fe^{2+}$ ✓ bal.✓

Reactants/*Reaktante*✓ Products/*Produkte* ✓ Balancing/*Balansering* ✓ (3)

8.7 $E^\ominus_{cell} = E^\ominus_{reduction} - E^\ominus_{oxidation}$✓

$E^\ominus_{cell}$ = -0,27✓ –(-0,44) ✓ = 0,17 V✓

NOTE/*NOTA*:
- Accept any other correct formula from the data sheet./*Aanvaar enige ander korrekte formule vanaf die inligtingsblad.*
- Any other formula using unconventional abbreviations, e.g.
  $E^\ominus_{cell} = E^\ominus_{OA} - E^\ominus_{RA}$ followed by correct substitutions/
  Enige ander formule wat onkonvensionele afkortings gebruik, bv.
  $E^\ominus_{sel} = E^\ominus_{OM} - E^\ominus_{RM}$ gevolg deur korrekte vervanging : ¾

(4)

8.8 0(V)✓ (1)
[18]

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QUESTION/*VRAAG* 9

9.1 Solution that conducts electricity through movements ions✓✓ **(2 or 0)**
Oplossing wat elektrisiteit gelei deur die beweging van ione (2)

9.2 Copper sulphate/*Kopersulfaat*/$CuSO_4$✓ (1)

9.3 Anode/*Anode*✓ Oxidation takes place/*Oksidasie vind plaas* ✓ (2)

9.4 $Cu^{2+} + 2e^- \rightarrow Cu$ ✓✓

NOTE/*NOTA*
- $Cu^{2+} + 2e^- \rightleftharpoons Cu$ ($^1/_2$)
- $Cu \leftarrow Cu^{2+} + 2e^-$ ($^2/_2$)
- $Cu \rightleftharpoons Cu^{2+} + 2e^-$ ($^0/_2$)
- $Cu \rightarrow Cu^{2+}(aq) + 2e^-$ ($^0/_2$)
- Ignore charges omitted on electron/*Ignoreer indien lading weggelaat is op elektron.*
- If charge (+) omitted on Cu^{2+}/ *Indien lading (+) weggelaat is op* Cu^{2+} Max. ($^1/_2$)
  Example: $Cu^2 + 2e^- \rightarrow Cu$ ✓
- Ignore phases/*Ignoreer fases* (2)

9.5

Marking criteria:

- Calculate Q using Q = IΔt ✓
- Calculate number of elctrons using $n = \frac{Q}{e^-}$ ✓
- Calculate n using $n = \frac{N}{N_A}$ ✓
- Calculate $n_{(Cu)}$ using the ratio 1 : 2 correctly ✓
- Calculate the mass of Cu (n x 63,5) ✓
- Answer 0,59 g ✓

Nasienkriteria:

- *Bereken Q deur* Q = IΔt te gebruik
- *Bereken die aantal elektrone deur* $n = \frac{Q}{e^-}$ *te gebruik*
- *Bereken n deur* $n = \frac{N}{N_A}$ *te gebruik* ✓
- *Bereken* $n_{(Cu)}$ *deur die verhouding 1 : 2 korrek te gebruik*
- *Bereken die massa van Cu (n x 63,5)*
- *Antwoord 0,59 g* ✓

$Q = I \times \Delta t$

$Q = 1,5 \times 1200$ ✓

$= 1800$ C

$n = \frac{1800}{1,6 \times 10^{-19}}$ ✓

$= 1,125 \times 10^{22}$ electrons/*elektrone*

$n = \frac{N}{N_A}$

$= \frac{1,125 \times 10^{22}}{6,02 \times 10^{23}}$ ✓

$= 0,01868771$ mol

$n_{(Cu)} = ½ \times 0,01868771$ ✓

$= 9,344 \times 10^{-3}$ mol

$m = n \times M$

$= 9,344 \times 10^{-3} \times 63,5$ ✓

$m = 0,59$g ✓

(6)
[13]

TOTAL/*TOTAAL*: 150

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