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Province of the EASTERN CAPE EDUCATION

NATIONAL SENIOR CERTIFICATE/ *NASIONALE SENIORSERTIFIKAAT*

GRADE/*GRAAD* 11

NOVEMBER 2023

PHYSICAL SCIENCES P2 MARKING GUIDELINE/ *FISIESE WETENSKAPPE V2 NASIENRIGLYN*

MARKS/*PUNTE:* **150**

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This marking guideline consists of 12 pages./
Hierdie nasienriglyn bestaan uit 12 bladsye.

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QUESTION/*VRAAG* 1

1.1 D ✓✓ (2)

1.2 A ✓✓ (2)

1.3 A ✓✓ (2)

1.4 C ✓✓ (2)

1.5 B ✓✓ (2)

1.6 C ✓✓ (2)

1.7 C ✓✓ (2)

1.8 A ✓✓ (2)

1.9 C ✓✓ (2)

1.10 C ✓✓ (2)

[20]

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QUESTION/*VRAAG 2*

2.1 2.1.1 A group of two or more atoms covalently bonded ✓ that function as a unit. ✓

'n Groep van twee of meer atome wat kovalent verbind ✓ is en wat as 'n eenheid funksioneer. ✓ (2)

2.1.2 H_3O^+ ✓ (1)

2.1.3 NaCℓ ✓ (1)

2.1.4 NaCℓ ✓ (1)

2.2 2.2.1



✓✓ (2)

2.2.2



✓✓ (2)

2.3 1 ✓ (1)

2.4 Non-polar ✓
- B – Cℓ is a polar bond ✓ (ΔEN = 3,0 – 2,0 = 1)
- $BCℓ_3$ is a trigonal planar ✓
- Charge distribution /molecular geometry / molecule is symmetrical ✓ / The polar bonds cancel each other out

Nie-polêr
- *B – Cℓ is 'n polêre binding (ΔEN = 3,0 – 2,0 = 1)*
- *$BCℓ_3$ het 'n trigonaal planêre vorm*
- *Lading verspreiding / molekulêre vorm(geometrie) / molekule is simmetries / Die polêre bindings kanselleer mekaar uit.* (4)

2.5 2.5.1 It is the energy needed to break one mole ✓of a compound's molecules into separate atoms. ✓

Dit is die energie wat benodig word om een mol van 'n verbinding se molekules in aparte atome op te breek. (2)

2.5.2 B ✓ (1)

2.6 2.6.1 C ≡ C ✓ (1)

2.6.2
- The higher the bond energy the stronger the forces of attraction between the nuclei. ✓
- The nuclei come closer resulting in a shorter length. ✓

- *Hoe hoër die bindingsenergie hoe sterker is die aantrekkingskragte tussen die kerne.*
- *Die kerne kom nader aan mekaar wat na korter lengte lei.* (2)

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QUESTION/*VRAAG* 3

3.1 The temperature at which the vapour pressure ✓of a liquid equals the atmospheric pressure ✓

Die temperatuur waarby die dampdruk van 'n vloeistof gelyk aan die atmosferiese druk is.

3.2 Gas phase / *Gasfase* ✓ (1)

3.3 **From A to D / *Van A tot D***
- The molecular size / surface area increases ✓
- The strength of the London forces / dispersion forces/ induced dipole forces increases ✓
- More energy is needed to overcome the intermolecular forces. ✓

- *Die molekulêre grootte / oppervlakte neem toe.*
- *Die sterkte van die London-krag / Dispersiekrag / geïnduseerde dipool-kragte neem toe.*
- *Meer energie word benodig om die intermolekulêrekragte te oorkom.*

OR / *OF*

From D to A / *Van D tot A*
- The molecular size / surface area decreases ✓
- The strength of the London forces / dispersion forces/ induced dipole forces decreases ✓
- Less energy is needed to overcome the intermolecular forces. ✓

- *Die molekulêre grootte / oppervlakte neem af*
- *Die sterkte van die London-krag / dispersiekrag /geïnduseerde dipool-kragte neem af*
- *Minder energie word benodig om die intermolekulêrekragte te oorkom.* (3)

3.4 CH_4 ✓
Lowest boiling point / *Laagste kookpunt* ✓ (2)

3.5 Higher than / *Hoër as* ✓ (1)

3.6
- HCℓ has dipole-dipole forces ✓
- CH_4 have London/dispersion/induced dipole forces
- Dipole forces are stronger than the London/dispersion/induced dipole forces ✓
- More energy is needed to overcome the intermolecular forces in HCℓ ✓

- *HCℓ het dipool-dipoolkragte*
- *CH_4 het London / verpreidings / geïnduseerde dipool-kragte*
- *Dipoolkragte is sterker as die London/verpreidings/geïnduseerde dipool-kragte*
- *Meer energie word benodig om die intermolekulêrekragte in HCℓ te oorkom*

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OR / *OF*

- HCℓ has dipole-dipole forces ✓
- CH_4 have London/dispersion/induced dipole forces
- The London/dispersion/induced dipole forces are weaker than the dipole-dipole forces ✓
- Less energy is needed to overcome the intermolecular forces in CH_4 ✓

- *HCℓ het dipool-dipoolkragte*
- *CH_4 het London/verspreidings/geïnduseerde dipoolkragte*
- *Die London/verpreidings/ geïnduseerde dipoolkragte is swakker as die dipool-dipoolkragte*
- *Minder energie word benodig om die intermolekulêrekragte in CH_4 te oorkom*

(3)
[12]

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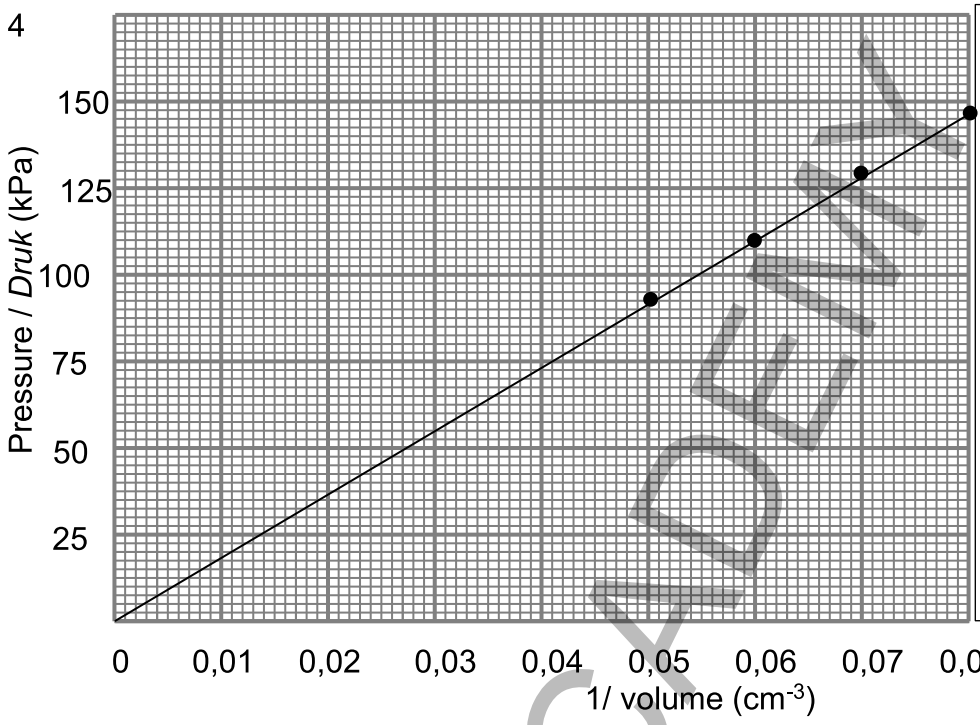
QUESTION/*VRAAG 4*

4.1 Boyles law / *Boyle se wet* ✓ (1)

4.2 Temperature or amount of gas / *Temperatuur of hoeveelheid gas*✓ (1)

4.3 (Bourdon) Pressure gauge / *(Bourdon) drukmeter* ✓ (1)

4. 4



Marking criteria
- Points correctly plotted 2
- Straight line graph drawn through the points 2

Nasienkriteria
- *Twee punte korrek geplot*
- *Reguitlyn grafiek deur 2 punte*

(4)

4.5 Pressure is directly proportional to the inverse of volume ✓/Pressure is inversely proportional to volume. ✓
Druk is direk eweredig aan die omgekeerde volume / Druk is omgekeerd eweredig aan die volume. (2)

4.6 $p_1V_1 = p_2V_2$ ✓

(148)(1/0,08) ✓ = (184)V_2 ✓

V_2 = 10,05 cm^3 ✓ (Any other correct point / *Enige ander punte wat korrek is*) (4)

4.7 At high pressure ✓ the volume of (real gas) particles become significant. ✓

By hoë temperatuur sal die volume van 'n (egtegas) deeltjies aansienlik word. (2)

4.8 NH_3 has strong ✓ hydrogen bonds ✓ (and at low temperature it will easily liquify).

NH_3 het sterk ✓ waterstofbindings ✓ (en by lae temperature sal dit maklik 'n vloeistof word.) (2)

[17]

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QUESTION/*VRAAG 5*

5.1 5.1.1 ENDOTHERMIC/*ENDOTERMIES* ✓ (1)

5.1.2 $\Delta H > 0$ ✓✓/Net energy is absorbed/Energy of products greater than that of reactants.

$\Delta H > 0$ / Netto energie word geabsorbeer / Energie van die produkte is hoër as dié van die reaktanse. (2)

5.1.3 Number of particles / atoms / molecules / formula-units in one mole. ✓

Aantal deeltjies / atome / molekules / formule-eenhede in een mol.

5.1.4 (a) $n = m / M$

$n = 0,163 / 44$ ✓

$n = 0,0037$ mol

$N = nN_A$ ✓

$N = (0,0037)(6,02 \times 10^{23})$ ✓

$N = 2,227 \times 10^{21}$ particles/deeltjies ✓ (4)

5.1.4 (b) **Marking criteria / *Nasienkriteria***

- Mole ratio / *Mol verhouding* $CO_2 : CaCO_3$
- Subst. $n(CaCO_3)$ mole into/ *Vervang n ($CaCO_3$) in* $m = nM$

$n(CO_2)$ formed /*gevorm* = 0,0037 mol

$n(CaCO_3)$ reacting / *reageer* = 0,0037 mol ✓

$n(CaCO_3)$ initial / *aanvanklik* = m/M = 1,56/100 ✓ = 0,0156 mol

OPTION 1 / *OPSIE 1* **Marking criteria / *Nasienkriteria*** • Subtraction of $CaCO_3$ mole/ *Aftrekking van $CaCO_3$ mol* • Mole remaining into / *Mol oorbly in* m = nM • Final answer / *Finale antwoord*	**OPTION 2 / *OPSIE 2*** **Marking criteria / *Nasienkriteria*** • Mole reacting into / *Mol reageer in* m = nM • Subtraction of $CaCO_3$ mass/ *Aftrekking van $CaCO_3$ massa* • Final answer / *Finale antwoord*
n (remaining / *oorbly*) = 0,0156 – 0,0037 ✓ n (remaining / *oorbly*) = 0,0119 mol m (remaining / *oorbly*) = 0,0119 x 100 ✓ m (remaining / *oorbly*) = 1,19 g ✓	m (react / reageer) = 0,0037 x 100 ✓ m (react / reageer) = 0,37 g m (remaining / *oorbly*) = 1,56 – 0,37✓ m (remaining / *oorbly*) = 1,19 g ✓

(5)

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5.2 **Marking criteria**

- Subst. into n = m / M e.g. 44,4 / 12 ; 6,21 /1 ; 39,5 / 32 ; 9,86 / 16
- Dividing by the smallest mole number 0,62
- Ratio molecular mass: Formula mass
- Molecular formula

Nasienkriteria

- *Vervanging in n = m / M bv 44,4 / 12 ; 6,21 /1 ; 39,5 / 32 ; 9,86 / 16*
- *Deel deur die kleinste mol getal 0,62*
- *Verhouding molekulêre massa : Formule massa*
- *Molekulêre formule*

Element	**Mass / *Massa***	**Mole (n = m /M)**	**Simplest ratio/ *Vereenvoudigste verhouding***
	44,4	44,4 / 12 ✓ = 3,7	3,7 / 0,62 = 6
	6,21	6,21 / 1 ✓ = 6,21	6,21 / 0,62 = 10
	39,5	39,5 / 21 ✓ = 1,23	1,23 / 0,62 = 2
	9,86	9,86 / 16 ✓ = 0,62	0,62 / 0,62 = 1

Div. by / *Deel deur* 0,62 ✓

Empirical formula / *Emperiese formule*: $C_6H_{10}S_2O$

Formula mass/ *Formule massa* = 6(12) + 10(1) + 2(32) + 16 = 162

Ratio = Molar mass: Emprical formula
Verhouding = Molekulêre massa: Emperiese formule

Ratio/ *Verhouding* = 1 : 1 ✓

Molecular formula / *Molekulêre formule*: $C_6H_{10}S_2O$ ✓

[20]

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QUESTION/*VRAAG 6*

6.1 The substance that is completely used up/reacted ✓✓ during a chemical reaction.
Dit is die stof wat heeltemal opgebruik word / volledig gereageer tydens 'n chemiese reaksie. (2)

6.2 Avogadro's ✓(law / *se wet*) (1)

6.3 **Marking criteria / *Nasienkriteria***
- Formula / *Formule* n = V / V_m
- Subst. into / *Vervanging in* n = V / V_m
- Mole ratio / *Mol verhouding* CO_2 : HCℓ
- Compare required and available mole / *Vergelyk die vereiste en beskikbare mol*
- Correct identification of limiting reagent / *Identifiseer die korrekte beperkende reagens*

n (CO_2) = V / V_m ✓

n (CO_2) = 0,448 / 24,47 ✓

n (CO_2) = 0,018 mol

n (HCℓ) required/*benodig* = 1/2 n (CO_2)

n (HCℓ) required/*benodig* = 1/2 n (0,018) ✓

n (HCℓ) required/*benodig* = 0,009 mol

n (HCℓ) available/beskikbaar= 0,028 mol ✓

∴ Na_2CO_3 is the limiting reagent / *is die beperkende reagens* ✓ (5)

6.4 n (CO_2) = n (Na_2CO_3) = 0,018 mol ✓

m = nM ✓

m = (0,018)(106) ✓

m = 1,908 g ✓ (4)
[12]

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QUESTION/*VRAAG 7*

7.1 The minimum energy required ✓ for a chemical reaction to start. ✓
Die minimum energy benodig vir 'n chemiese reaksie om te begin.

7.2 7.2.1 **RP** = Δ H ✓/Heat of reaction/Enthalpy / *Reaksiewarmte / Entalpie* (1)

7.2.2 **QP** = Activation energy / *Aktiveringsenergie* ✓ (1)

7.3 ΔH reaction / *reaksie* = H products / *produkte* – H reactants /reaktanse ✓

- 216,7 = H products / *produkte* – 400 ✓

H products / *produkte* (**X**) = 183,3✓ ($kJ \cdot mol^{-1}$) (3)

7.4 DECREASES / *NEEM AF* ✓ (1)

7.5 **Marking Criteria**

- Use volume ratios to find $V(O_2)$, V(NO and $V(H_2O)$
- Finding $V(O_2)$ remaining
- Adding $V(O_2)$, V(NO and $V(H_2O)$
- Conversion to dm^3
- Final answer

Nasienkriteria

- *Gebruik die volume verhouding om $V(O_2)$, V(NO en $V(H_2O)$ te vind.*
- *Vind $V(O_2)$ wat oorbly*
- *Tel $V(O_2)$, V(NO en $V(H_2O)$ bymekaar*
- *Herlei na dm^3*
- *Finale antwoord*

V (O_2) reacting/*reageer* = 5/4 x 60 = 75 cm^3

V (NO) formed/*gevorm* = V(NH_3) reacting/reageer = 60 cm^3 ✓

V (H_2O) formed/ *gevorm* = 6/4 x 60 = 90 cm^3

V O_2 remaining/*oorbly* = (90 – 75) = 15 cm^3 ✓

V total / *totaal* = 15 + 60 + 90 ✓

V total / *totaal* = 165/1 000 dm^3 ✓

= 0,165 dm^3 ✓ (5)

7.6 HIGHER / *HOËR* ✓ (1)
[14]

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QUESTION/*VRAAG 8*

8.1 8.1.1 Acid is a proton/ H^+ -ion donor ✓✓
'n Suur is 'n proton / H^+-oonskenker (2)

8.1.2 Acid/ *Suur*. ✓
Donates a proton / *Skenk 'n proton* ✓ /(H^+ -ion) (2)

8.1.3 H_3O^+ ✓ (1)

8.1.4 Blue / *Blou* ✓ (1)

8.2.1 The amount of solute ✓ per litre of solution ✓
Die hoeveelheid opgeloste stof per liter oplossing (2)

8.2 8.2.2 n = cV ✓

n = (0,9) (0,1) ✓

n = 0,09 mol ✓ (3)

8.2.3 **Positive marking from / *Positiewe nasien vanaf* 8.2.3**

Marking criteria / *Nasienkriteria*

- Subst. conc. and volume of / *Vervang kons. en volume van* NaOH into n = cV
- Use of mol ratio / *Gebruik mol verhouding* NaOH : HCℓ
- Subtract mol in reaction 2 with total mol / *Trek mol in reaksie 2 af van totale mol*
- Use mol ratio/ *Gebruik mol verhouding* HCℓ:MCO_3
- Subst into / *Vervang in* M = m / n
- Determine the molar mass of / *Bepaal die molêre massa van* M
- Correctly identify M / *Identifiseer M korrek*

n(NaOH) = cV

n(NaOH) = (0,8)(0,025) ✓

n(NaOH) = 0,02 mol

n(NaOH) = n(HCℓ) in excess / *in oormaat* = 0,02 mol ✓

n(HCℓ) reacting with carbonate/reageer met karbonaat = 0,09 – 0,02 ✓

n(HCℓ) = 0,07 mol

n(MCO_3) = ½ (0,07) ✓

n(MCO_3) = 0,035 mol

M = m / n

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M = 3,5 / 0,035 ✓
M = 100 g·mol^{-1}

M + 12 + 3 (16) = 100 ✓

M = 40 g·mol^{-1}

M = Ca ✓ (7)
[18]

QUESTION/*VRAAG 9*

9.1.1 Gain of electrons / *Wins aan elektrone* ✓✓ (2)

9.1.2 OXIDATION / *OKSIDASIE* ✓ (1)

Oxidation number of Cu increases ✓ from 0 to +2 ✓
Oksidasiegetal van Cu neem toe vanaf 0 na +2

9.1.3 NO_3^- ✓ (1)

9.1.4 $Ag^+ + e^- \rightarrow Ag$ ✓✓ (2)

9.2.1 x + 4(-2) = -2 ✓

x = + 6 ✓ (2)

9.2.2 $SO_2(g) + 2H_2O \rightarrow SO_4^{2-} + 4H^+ + 2e^-$ ✓✓
(*1/2* if double arrow is used / *as dubbelpyltjie gebruik is*) (2)

9.2.2
Marking criteria / *Nasienkriteria*
- Reduction half reaction / *Reduksie halfreaksie* ✓✓
- Reactants / *Reaktanse* ✓
- Products / *Produkte* ✓
- Balanced / *Gebalanseer* ✓

Oxidation ½ reaction / *Oksidasie ½ reaksie*: $SO_2(g) + 2H_2O \rightarrow SO_4^{2-} + 4H^+ + 2e^-$

Reduction ½ reaction / Reduksie ½ reaksie: $MnO_4^- + 8H^+ + 5e^- \rightarrow Mn^{2+} + 4H_2O$ ✓✓

Net ionic equation/netto ioniese reaksie:

$5SO_2(g) + 2\,MnO_4^- + 2H_2O$ ✓ $\rightarrow 5\,SO_4^{2-} + 2\,Mn^{2+} + 4\,H^+$ ✓ (✓ bal) (5)
[17]

TOTAL/*TOTAAL*: 150

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CHIEF DIRECTORATE: EXAMINATIONS AND ASSESSMENT
Steve Vukile Tshwete Complex, Zone 6 Zwelitsha, 5608, Private Bag X0032, Bhisho, 5605 REPUBLIC OF SOUTH AFRICA:
Enquiries: **Mrs P. Japhta Tel: 040 602 7031 . Fax : 040 608 7026. E-mail:** Penny.Japhta@ecdoe.gov.za
Website: www.ecdoe.gov.za

Ref. no. 13/P Tel.: (040) 608 7026/082 523 7689
Enquire: Mrs P. Japhta Fax: 040 608 7295

ERRATUM

TO: **ALL PRINCIPALS OF SCHOOLS IN THE FET BAND AND DISTRICT HEADS OF EXAMINATIONS**

FROM: **MRS P. JAPHTA**
(a) CES: ASSESSMENTS INSTRUMENT DEVELOPMENT AND ITEM BANK MANAGEMENT SUBDIRECTORATE

SUBJECT: **PHYSICAL SCIENCES P2 GR11 EXAMINATIONS ERRATUM**

DATE: **23 NOVEMBER 2023**

The Physical Sciences P2 Grade 11 for the November Examinations 2023 was written on Monday, the 20 November 2023. We were made aware of errors and omissions that was discovered during the marking process.

The amendment with regards to the marking was prepared in conjunction with the examiner and the moderator of the paper. This amendment addresses the errors and omissions and also ensures that learners are not disadvantaged. The following standardised approach to marking must be adopted across the Province.

Page	Question		Marks
13	6.3	Determine by calculation which substance is the liming reagent, Na_2CO_3 or HCℓ.	(5)
	6.4	Calculate the value of **x**.	(4)

Page	Error		Marks
13		With HCℓ as the limiting reagent the amount of CO_2 yield will not be possible.	
		Learners will not be able to calculate sub-questions 6.3 and 6.4.	

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Remedial action

Teachers must NOT mark QUESTIONS 6.3 AND 6.4.

Mark the paper out of 141 and convert it to 150 using the following conversion factor to get the learner's mark out 150 marks.

Example

90 / 141 x 150 = 96

The erratum is issued as a measure to assure that a fair and equitable approach is applied to assessment across the Province.

We request that this must be brought to the attention of all educators marking these papers and sincerely apologise for the inconvenience.

Yours in education.

23 November 2023

MRS P.E. JAPHTHA
(a) CES: ASSESSMENTS INSTRUMENT DEVELOPMENT AND ITEM BANK MANAGEMENT SUBDIRECTORATE

DATE

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