Province of the
EASTERN CAPE
EDUCATION

NATIONAL
SENIOR CERTIFICATE/
NASIONALE
SENIOR SERTIFIKAAT

GRADE/*GRAAD* 11

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PHYSICAL SCIENCES P2/ *FISIESE WETENSKAPPE V2* MARKING GUIDELINE/*NASIENRIGLYN* (EXEMPLAR/*EKSEMPLAAR)*

MARKS/*PUNTE*: 150

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

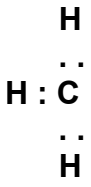
QUESTION 1/*VRAAG 1*

1.1 A √√ (2)
1.2 C √√ (2)
1.3 D √√ (2)
1.4 C √√ (2)
1.5 A √√ (2)
1.6 B √√ (2)
1.7 A √√ (2)
1.8 A √√ (2)
1.9 D √√ (2)
1.10 B √√ (2)
[20]

QUESTION 2/*VRAAG 2*

2.1 The sharing of electrons between two atoms to form a molecule. ✓✓ /
Die deel van elektrone tussen twee atome om 'n molekuul te vorm. (2)

2.2



✓✓ (2)

2.3 2.3.1 C – H. ✓ O-atom has a smaller atomic radius than the C-atom. ✓
O-atoom het 'n 2 kleiner atomiese radius as die C-atoom.

OR/ *OF*

C-atom has a larger atomic radius than the O-atom.
C-atoom het 'n groter atomiese radius as die O-atoom. (2)

2.3.2 O - H ✓ (1)

2.4 Two / Twee ✓ **OR/*OF*** 2 (1)

2.5 NH_4^+ ✓ (1)

2.6 N-atom is more electronegative than the H-atom. ✓
The NH_3 molecular geometry/charge distribution is asymmetrical ✓ / The electron density (charges) will be distributed unevenly around the molecule.

N-atoom is meer elektron-negatief as die H-atoom
Die NH_3 se molekulêre geometrie/lading is asimmetries versprei /
Die elektrondigtheid (lading) sal oneweredig rondom die molekuul versprei wees.

C-atom is more electronegative than the H-atom ✓ but CH_4 molecular geometry / charge distribution is symmetrical ✓

C-atoom is meer elektron-negatief as die H-atoom maar die CH_4 molekulêre geometrie/lading verspreiding is simmetries. (4)
[13]

QUESTION 3/*VRAAG 3*

3.1 3.1.1 The temperature at which the vapour pressure of a liquid equals atmospheric pressure. ✓✓
Die temperatuur waarteen die dampdruk van 'n vloeistof gelyk aan die atmosferiese druk is. (2)

3.1.2 Gas ✓ (1)

3.1.3 Dipole-dipole ✓ (forces) / *Dipool-dipool (kragte)* (1)

3.1.4 **B** ✓
Compound **B** has larger molecular size ✓✓ / Compound **A** has a smaller molecular size
*Verbinding **B** het 'n groter molekulêre grootte / Verbinding **A** het 'n kleiner molekulêre grootte.* (3)

3.1.5 **A** ✓
Lower boiling point / ✓ *Laer kookpunt*

OR/*OF*

B has a higher boiling point / *B het 'n hoër kookpunt* (2)

3.1.6 Compound C/ HF has hydrogen bonds. ✓
HCℓ (A) and HBr (B) have dipole-dipole forces.

The hydrogen bonds / intermolecular forces in compound C / HF is stronger ✓than the dipole-dipole forces / intermolecular forces in HCℓ (A) and HBr (B).
Therefore more energy will be required to overcome the intermolecular forces in HF (A). ✓

Verbinding C/HF het waterstofbindings.
HCℓ (A) en HBr (B) het dipool-dipoolkragte.

Die waterstofbinding/intermolekulêrekragte in verbinding C / HF is sterker as die die dipool-dipoolkragte/intermolekulêrekragte in HCℓ (A) en HBr (B).
Daarom word meer energie benodig om die intermolekulêrekragte in HF (A te oorkom).

OR/*OF*

Compound C / HF has hydrogen bonds. ✓
HCℓ (A) and HBr (B) have dipole-dipole forces.
The dipole-dipole forces / intermolecular forces in compounds HCℓ (A) and HBr (B) is weaker ✓than the intermolecular forces in HF (C)
Therefore less energy will be required to overcome the intermolecular forces in HCℓ (A) and HBr (B). ✓

Verbinding C / HF het waterstofbindings
HCℓ (A) en HBr (B) het dipool-dipoolkragte

Die dipool-dipool/intermolekulêre kragte in verbindings HCℓ (A) en HBr (B) is swakker as die waterstofbinding/intermolekulêrekragte in HF (C).
Daarom word minder energie benodig om die intermolekulêrekragte in HCℓ (A) en HBr (B) te oorkom.

3.2 3.2.1 $CC\ell_4$ ✓ (1)

3.2.2 $CC\ell_4$ and I_2 have London forces only. ✓
H_2O has (London forces) and hydrogen bonds ✓
Intermolecular forces in solution are of comparable magnitude (CCl_4) ✓
OR IMF in solution are not of comparable magnitude (H_2O)
$CC\ell_4$ en I_2 het slegs Londenkragte
H_2O het (londenkragte) en waterstofbindings ***OF***
Intermolekulêrekragte in oplossing is van vergelykbare grootte. (3)
[16]

QUESTION 4/*VRAAG 4*

4.1 Charles' law ✓ / *Charles se wet* (1)

4.2 4.2.1 What effect will a change in temperature have on the volume of the gas? ✓✓/
What is the relationship between temperature and volume of gas?

Watter effek sal die verandering in temperatuur op die volume van die gas hê?
Wat is die verhouding tussen temperatuur en volume van die gas?

Marking guideline/*Nasienriglyn*
• Correct independent and dependent variable
• *Korrekte onafhanklike en afhanklike veranderlike*
• In the form of a question
• *In die vorm van 'n vraag*

(2)

4.2.2 Pressure OR the amount of gas.
Druk OF hoeveelheid gas
Any one/*Enige een* ✓ (1)

4.3 Thermometer/ *Termometer* ✓ (1)

4.4 4.4.1 $\frac{T_1}{V_1} = \frac{T_2}{V_2}$ ✓

$\frac{269}{66}$ ✓ $= \frac{T_2}{67}$ ✓

$T_2 = 273{,}08\ K$

R = 273,08 ✓ (K) (4)

4.4.2 $n = \frac{m}{M}$

$n = \frac{132}{44}$ ✓

$n = 3\ mol$

pV = nRT ✓

$p(66 \times 10^{-3})$ ✓ = (3)(8,31)(269) ✓

p = 101 608,64 Pa ✓ (5)

4.5 Low temperature ✓ and high pressure ✓/ *Lae temperatuur en hoë druk* (2)

4.6 H_2 ✓
H_2 has smaller molecules ✓ and weaker intermolecular forces ✓ /
H_2 het kleiner molekules en swakker intermolekulêrekragte. (3)
[19]

QUESTION 5/*VRAAG 5*

5.1 The minimum energy needed for a reaction to take place. ✓✓ /
Die minimum energie wat benodig word vir 'n reaksie om plaas te vind. (2)

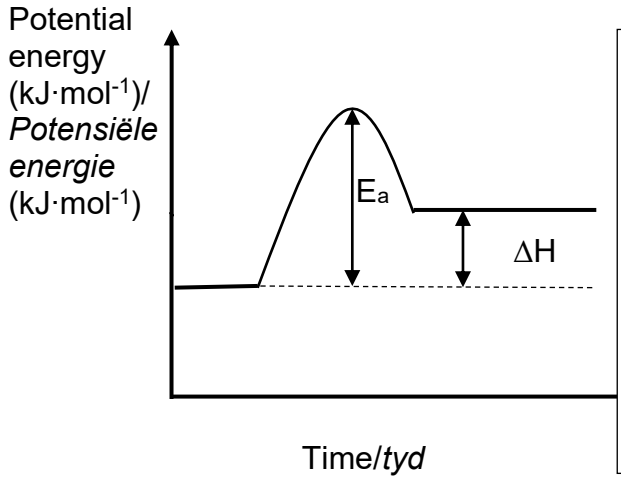
5.2 Reaction / *Reaksie* **I**. ✓
The temperature of the reaction mixture increases. ✓
Die temperatuur van die reaksiemengsel verhoog. (2)

5.3 NEGATIVE / *NEGATIEF* ✓ (1)

5.4 Catalyst / *Katalisator* ✓ (1)

5.5 LARGER THAN / *GROTER AS* ✓✓ (2)

5.6



Marking criteria / *Nasienkriteria*

Correct shape ✓
Korrekte vorm

ΔH correctly indicated ✓
ΔH korrek aangedui

E_a correctly indicated ✓
E_a korrek aangedui

(3)
[11]

QUESTION 6/*VRAAG 6*

6.1 6.1.1 The simplest whole number ratio of elements in a given compound ✓✓ /
Die eenvoudigste heelgetalverhouding van elemente in 'n gegewe verbinding (2)

6.1.2 $n\ (C) = \frac{m}{M}$ ✓

$n\ (C) = \frac{54,55}{12}$ ✓= 4,55 mol

$n\ (H) = \frac{9,09}{1}$ ✓= 9,09 mol

$n\ (O) = \frac{36,36}{16}$ ✓= 2,27 mol

n (C) : n (H) : n (O)

$\frac{4,55}{2,27} : \frac{9,09}{2,27} : \frac{2,27}{2,27}$ ✓

2 : 4 : 1
Empirical formula / *Empiriese formule*: $C_2H_4O_1$ ✓ (6)

6.1.3 Ratio / *Verhouding* = $\frac{\text{molar mass}/molêre\ massa}{\text{formula mass}/formule\ massa}$

Ratio / *verhouding* = $\frac{88}{44}$ ✓

Ratio / *verhouding* = 2

Molecular formula / *Molekulêre formule*: $C_4H_8O_2$ ✓ (2)

6.2 6.2.1 The amount of solute per litre/volume of solution ✓✓ /
Die hoeveelheid opgeloste stof per liter/volume van oplossing (2)

6.2.2 $c = \frac{m}{MV}$ ✓

$c = \frac{8}{(40)✓(0,25)}$ ✓

$c = 0,8 \text{ mol} \cdot \text{dm}^{-3}$ ✓

n= m/M
= 8/40 ✓
= 0,2 mol

c = n/V
= 0,2/0,25 ✓
= 0,8 mol.dm^{-3} ✓

for both formulae/
vir beide formules

Marking guide / *Nasienriglyn*
- Formula / *Formule* ✓ ✓
- Substitution of /*substitusie van* 8 and / *en* 0,25 or/ *of* 0,2 and 0,25
- Substitution of / *substitusie van* 40/
- Final answer / *Finale antwoord* ✓

(4)

6.3 NaN_3

$n = \frac{m}{M}$

$n = \frac{55}{65}$ ✓

$n = 0,85 \text{ mol}$

Mole ratio / *molverhouding*: NaN_3 : N_2
2 : 3

n (N_2) = $0,85 \times \frac{3}{2}$ ✓

n (N_2) = 1,275 mol

V = nV_m

V = (1,275)(22,4) ✓

V = 28,56 dm^3 ✓

Any one / *Enige een* ✓

(5)
[21]

QUESTION 7/*VRAAG 7*

7.1 The substance that is completely used-up in a chemical reaction. ✓✓ /
Die stof wat volledig in 'n chemiese reaksie opgebruik word. (2)

7.2

H_2SO_4 $n = \frac{m}{M}$ ✓ $n = \frac{2000}{98}$ ✓ $n = 20{,}41\ mol$	
Mole ratio / *mol verhouding* = $\frac{H_2SO_4}{NH_3}$ Mole ratio / *mol verhouding* = $\frac{1}{2}$ = 0,5 ✓ Mole ratio / *mol verhouding* = $\frac{20{,}41}{58{,}82}$ ✓= 0,34 Ratio smaller than / *Verhouding kleiner as* 0,5.	**OR / *OF*** Mole ratio / *mol verhouding* = $\frac{NH_3}{H_2SO_4}$ Mole ratio / *mol verhouding* = $\frac{2}{1}$ = 2 Mole ratio / *mol verhouding* = $\frac{58{,}82}{20{,}41}$ = 2,88 Ratio greater than / *Verhouding groter as* 2.
H_2SO_4 is the limiting reagent / *H_2SO_4 is die beperkende reagens.*	

n $[(NH_4)_2SO_4]$= $20{,}41 \times \frac{1}{1}$ = 20,41 ✓

m = nM

m = (20,21)(132) ✓

m = 2 667,72 g ✓ (7)
[9]

QUESTION 8/*VRAAG 8*

8.1 8.1.1 A base is a proton/H^+ ion acceptor. ✓✓ /
'n Basis is 'n protoon/H^+ ioon-aanvaarder (2)

8.1.2 HPO_4^{2-} and/en PO_4^{3-}✓ **OR/OF** H_3O^+ and/en H_2O (1)

8.1.3 ACIDIC / SUUR**.** ✓
(Excess)/ (*Oormaat)* H_3O^+ ✓ are produced / *word geproduseer.* (2)

8.1.4 HPO_4^{2} ✓✓ (2)

8.2 $CuO + 2HNO_3$✓ ⟶ $Cu(NO_3)_2 + H_2O$✓ ✓Balancing / *Balansering*

Marking guide/ *Nasienriglyn*
- Reactants / *Reaktante*
- Products / *Produkte*
- Balancing / *Balansering*

(3)

8.3 8.3.1

Marking guide / *Nasienriglyn*
- Formula / *Formule* n = cV
- Substitution into / *Substitusie in* n= cV
- Ratio / *Verhouding* $CaCO_3$: H_2SO_4aCO3: H2SO4
- Formula / *Formule* n= m/M
- Substitution / *Substitusie* of 100 into n = m/M
- Calculation of / *Berekening van* % Purity */ Suiwerheid*
- Final answer / *Finale antwoord*

$n_{acid\ reacting\ /\ suur\ wat\ reageer\ het}$= cV ✓
= 1,5 x 200/1000 ✓
= 3 mol
M ($CaCO_3$) used / *gebruik* = nM ✓
= 3 x 100 ✓
= 30 g
% Purity/ Suiwerheid = $m_{pure/suiwer}/m_{impure/onsuiwer}$ x 100
= 30/40 x 100 ✓
= 75% ✓ (6)

8.3.2 $c_1V_1 = c_2V_2$
9 x 10 ✓ = 1,5 ✓V
60 cm^3 = $V_{solution\ /\ oplossing}$
V_{water} = 60 –10 ✓
= 50 cm^3 ✓ (4)
[20]

QUESTION 9/*VRAAG 9*

9.1 9.1.1 Loss of electrons ✓✓ / *Verlies van elektrone* (2)

9.1.2 Zn ✓✓ (2)

9.1.3 $Fe^{3+} + e^- \rightarrow Fe^{2+}$ ✓✓ (2)

9.2 9.2.1 + 5 ✓✓ (2)

9.2.2 $Ag\ (s) \rightarrow Ag^+\ (aq) + e^-$ ✓

$NO_3^-\ (aq) + 2\ H^+ + e^- \rightarrow NO_2\ (g) + H_2O$ ✓

$Ag\ (s)\ NO_3\ (aq) + 2\ H^+ \rightarrow Ag^+\ (aq) + NO_2\ (g) + H_2O$ ✓✓

Marking guideline/ *Nasienriglyn*
Correct oxidation half reaction / *Korrekte oksidasie halfreaksie*
Correct reduction half reaction / *Korrekte reduksie halfreaksie*
Final reaction correct / *Finale reaksie korrek*
Balanced / *Gebalanseerd*

(4)
[12]

QUESTION 10/*VRAAG 10*

10.1 10.1.1 Witwatersrand ✓ (1)

10.1.2 Reduced ✓ / *Gereduseer/verminder*

Oxidation number (of Au) decreases ✓✓ (from +1 to 0) /
Oksidasiegetal (van Au) verlaag (vanaf +1 tot 0) (3)

10.1.3 NaCN is harmful as it is poisonous to humans ✓✓ /
NaCN is skadelik omdat dit giftig is vir mense (2)

10.1.4 Smelting ✓ (1)

10.2 10.2.1 Release of greenhouse gas / CO_2 / Global warming ✓
Air pollutions/toxins released into air. ✓

Vrystelling van kweekhuisgas / CO_2 / Aardverwarming /
Lugbesoedeling / gifstowwe wat in die lug vrygestel word. (2)
[9]

TOTAL/*TOTAAL*: 150