Province of the
EASTERN CAPE
EDUCATION

NATIONAL SENIOR CERTIFICATE/*NASIONALE SENIOR SERTIFIKAAT*

GRADE/*GRAAD* 11

NOVEMBER 2022

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

MARKS/*PUNTE*: 100

This marking guideline consists of 8 pages./
Hierdie nasienriglyn bestaan uit 8 bladsye.

QUESTION/*VRAAG 1*

1.1 A ✓✓ (2)

1.2 C ✓✓ (2)

1.3 A ✓✓ (2)

1.4 B ✓✓ (2)

1.5 C ✓✓ (2)

1.6 A ✓✓ (2)

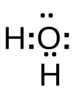
1.7 D ✓✓ (2)
[14]

QUESTION/*VRAAG 2*

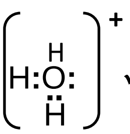
2.1 A group of two or more covalently bonded atoms that function as a unit. ✓✓
'n Groep van twee of meer atome wat kovalent verbind is en as 'n eenheid funksioneer. (2)

2.2 2.2.1

✓✓ (2)

2.2.2

✓✓ (2)

2.3 2.3.1 Dative covalent bond/Co-ordinate covalent bond ✓
Datiewe kovalentebinding/Gekoördineerde kovalentebinding (1)

2.3.2

✓✓ (2)

2.4 H_2O ✓

$\underline{O_2}$

The difference in electronegativity is 0. ✓

Die verskil in elektronegatiwiteit is 0.

$\underline{H_2O}$

O-atom is more electronegative than the H-atom /
The O – H bond is polar ✓

O-atoom is meer elektronegatief as die H-atoom/ Die O – H binding is polêr.

The molecular geometry is asymmetrical/bent/angular. ✓

Die molekulêre geometrie is asimmetries/gebuig/hoekig. (4)

[13]

QUESTION/*VRAAG 3*

3.1 The temperature at which the solid and liquid phases (of a substance are) in equilibrium. ✓✓

Die temperatuur waarteen vastestof en vloeistof fases (van 'n stof) in ewewig is. (2)

3.2 The molecular size/mass increases from CH_4 to $CCℓ_4$. ✓

All three molecules have London forces/induced-dipole forces/ dispersion ✓

The strength of London forces/induced-dipole forces/dispersion forces increases with an increase in molecular size/mass. ✓

More energy will be required to overcome the London forces with the molecules with the higher melting point ✓

Die molekulêre grootte/massa vergroot van CH_4 na $CCℓ_4$
Al drie molekules het Londonkragte./geïnduseerde dipoolkragte/dispersie
Die sterkte van die Londonkragte geïnduseerde dipoolkragte/dispersie vergroot met 'n toename in molekulêre grootte/massa
Meer energie word benodig om die Londonkragte te oorkom in die molekules wat hoër smeltpunte het. (4)

3.3 CH_4 ✓

Lowest melting point / *Laagste smeltpunt* ✓ (2)

3.4 $CCℓ_4$ have only London forces ✓/induced-dipole forces/dispersion / *het slegs Londonkragte geïnduseerde dipoolkragte/dispersie*

H_2O has both hydrogen bonds (and London forces/induced-dipole forces/dispersion /) *het beide waterstofbindings (en Londonkragte geïnduseerde dipoolkragte/dispersie)* ✓

The hydrogen bonds are stronger than the London forces ✓

Die waterstofbinding is sterker as die Londonkragte (2)

3.5 Dipole-induced dipole forces / *Dipool-geïnduseerde dipoolkragte* ✓ (2)

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QUESTION/*VRAAG 4*

4.1 4.1.1 Boyle's law/*Boyle se wet* ✓ (1)

4.1.2 Temperature/*Temperatuur* **OR/*OF*** the amount of gas/*die hoeveelheid gas* ✓ (1)

4.1.3 The pressure of the gas is inversely proportional to the volume of the gas. ✓✓
Die druk van die gas is omgekeerd eweredig aan die volume van die gas. (2)

4.2 $p_1V_1 = p_2V_2$ ✓

(100,33) (7,34) ✓ = X (6,97) ✓ **OR/*OF*** 102,2 x 7,21 = X. 6,97

X = 105,66 (kPa) ✓ X = 105,66 (kPa) ✓

OR/OF 103,93. 7,09 = X. 6,97
X = 105,66 (kPa)

(Any two point (co-ordinates) can be used / *enige twee punte (koördinate) kan gebruik word.*) (4)

4.3 High temperature / *Hoër temperatuur* ✓ and/*en* low pressure/ *lae druk* ✓ (2)

4.4 Helium ✓ or / *of* Hydrogen / *Waterstof* (1)
[11]

QUESTION/*VRAAG 5*

5.1 5.1.1 The simplest whole number ratio between the elements/atoms of a compound. ✓✓
Die eenvoudigste heelgetal verhouding tussen die elemente/atome van 'n verbinding. (2)

5.1.2

Element	**Mass/*Massa***	**Mole/Mol**	**Simplest mol ratio** ***Eenvoudigste mol-verhouding***
C	54,55	= 54,55 / 12 ✓ = 4,55	= 4,55 / 2,27 = 2
H	9,09	= 9,09 / 1 ✓ = 9,09	= 9,09 / 2,27 = 3
O	36,36	= 36,36 / 16 ✓ = 2,27	= 2,27 / 2,27 = 1

(Dividing by 2,27 in last column / *Deel die laaste kolom deur 2,27*) ✓

Empirical formula/*Empiriese formule*: C_2H_3O

Molecular formula/*Molekulêre formule*: $C_4H_6O_2$ ✓ (5)

5.2 5.2.1 The substance that is completely used up during a chemical reaction. ✓✓
Die stof wat volledig tydens 'n chemiese reaksie reageer/opgebruik word. (2)

5.2.2 $n = \frac{m}{M}$ ✓

$n = \frac{7}{65}$ ✓

n = 0,11 mol of Zn

mole ratio / *mol verhouding* Zn : HCℓ
1 : 2

Actual / *Werklik* 0,11 : 1 ✓✓

The actual ratio of Zn to HCℓ is too small.
Die werklike verhouding van Zn tot HCℓ is te klein.

Therefore Zn is the limiting reagent ✓
Daarom is Zn die beperkende reagens (5)

5.2.3 Lower than/*Laer as* ✓

Zn is the limiting reagent / *Zn is die beperkende reagens* ✓
Smaller amount of zinc is used in experiment 2 ✓✓
Kleiner hoeveelheid sink word in eksperiment 2 gebruik (4)

5.2.4 $n = \frac{m}{M}$ ✓

$n = \frac{3,27}{65}$ ✓

n = 0,05 mol of Zn

n (Zn) = n (H_2) = 0,05 mol ✓

$V = nV_m$

V = (0,05)(25,7) ✓

V = 1,285 dm^3 ✓ (5)

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QUESTION/*VRAAG* 6

6.1 6.1.1 It is a substance that donates protons (H^+ ions) ✓✓
Dit is die stof wat protone (H^+-ione) skenk. (2)

6.1.2 H_3O^+ and/*en* H_2O ✓✓ **OR/OF** $HC\ell$ and $C\ell^-$ (2)

6.1.3 H_2O ✓ (1)

6.2.1 EXOTHERMIC / *EKSOTERMIES* ✓

$\Delta H < 0$ **OR / *OF*** Net energy is released / *Netto energie vrygestel* ✓ (2)

6.2.2 **<u>$CaCO_3$</u>**

m ($CaCO_3$) = 8 × 0,95 ✓

m ($CaCO_3$) = 7,6 g

$n = \frac{m}{M}$ ✓

$n = \frac{7,6}{100}$ ✓

n = 0,076 mol

<u>Mole ratio/*Molverhouding*</u>

n ($HC\ell$) = 2 n ($CaCO_3$)

n ($HC\ell$) = 2 (0,076) ✓

n ($HC\ell$) = 0,152 mol

<u>$HC\ell$</u>

$c = \frac{n}{V}$ ✓

$(0,5) = \frac{(0,152)}{V}$ ✓

V = 0,304 dm^3

V = 304 cm^3 ✓ (7)

[14]

QUESTION/*VRAAG 7*

7.1 7.1.1 Loss of electrons ✓✓ / *Verlies aan elektrone*
The reaction wherein the electrons is donated to./Die reaksie waarin elektrone geskenk word. (2)

7.1.2 $Ag^{+} + e^{-} \rightarrow Ag$ ✓✓ (2)

7.1.3 Cu ✓ (1)

7.1.4 The <u>oxidation number increases</u> ✓ from <u>0 to + 2</u> ✓
Die <u>oksidasiegetal neem toe</u> vanaf <u>0 tot + 2</u> (2)

7.2 7.2.1 $2x + 7(-2) = -2$

$x = +6$ ✓✓ (2)

7.2.2 Oxidation half reaction: $Fe^{2+} \rightarrow Fe^{3+} + e^{-}$ ✓
Oksidasie halfreaksie:

Reduction half reaction: $Cr_2O_7^{2-} + 14\ H^{+} + 6e^{-} \rightarrow 2\ Cr^{3+} + 7\ H_2O$ ✓
Reduksie-halfreaksie:

Net ionic equation: $6\ Fe^{2+} + Cr_2O_7^{2-} + 14\ H^{+} \rightarrow 6\ Fe^{3+} + 2\ Cr^{3+} + 7\ H_2O$ ✓✓
Netto ioniese reaksie:

<u>Marking criteria/*Nasienkriteria*</u>
Correct oxidation half reaction / *Korrek oksidasie halfreaksie 1/4*
Correct reduction half reaction / *Korrek reduksie halfreaksie 1/4*
Reactants and products correct in net ionic equation 2/4
Reaktante en produkte korrek volgens netto ioniese vergelyking
Balancing/*Balansering* (4)

[13]

TOTAL/*TOTAAL:* 100