



Province of the
EASTERN CAPE
EDUCATION

**NATIONAL
SENIOR CERTIFICATE**

GRADE/GRAAD 11

NOVEMBER 2015

**PHYSICAL SCIENCES P2/
FISIESE WETENSKAPPE V2
MEMORANDUM**

MARKS/PUNTE: 150

This memorandum consists of 9 pages./
Hierdie memorandum bestaan uit 9 bladsye.

QUESTION 1 / VRAAG 1

1.1 D ✓✓

1.2 C ✓✓

1.3 C ✓✓

1.4 C ✓✓

1.5 A ✓✓

1.6 A ✓✓

1.7 B ✓✓

1.8 C ✓✓

1.9 D ✓

1.10 B ✓✓

(10 x 2) [20]

QUESTION 2 / VRAAG 2

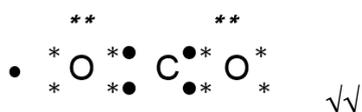
2.1 2.1.1 C ✓

2.1.2 E ✓

2.1.3 D ✓

2.2 A ✓ and/en D ✓

2.3.1



✓✓

(2)

2.3.2 • Electronegativity difference > 1 ✓✓ / (C-2.1 and O-3.5

∴ ΔEN = 1.4)

Verskil in elektronegatiwiteit > 1

- Uneven ✓ sharing of electron pairs ✓ / O-atoms have stronger pull on shared electron pairs.

Onewe deel van elektronpare / O-atome trek gedeelde elektronpare sterker aan.

(4)

[11]

QUESTION 3 / VRAAG 3

- 3.1 3.1.1 Induced-dipole induced dipole ✓ / London / dispersion forces
Geïnduseerde-dipool geïnduseerde dipool / London dispersiekrigte (1)
- 3.1.2 hydrogen bonds ✓ / *waterstofbindings* (1)
- 3.1.3 ion-dipole forces ✓ / *ion-dipool kragte* (1)
- 3.2 3.2.1
- Strong H-bonds between molecules ✓
 - Large amount of energy absorbed for small change in temperature ✓
 - *Sterk H-binding tussen molekule*
 - *Groot hoeveelheid energie word vir 'n klein toename in temperatuur geabsorbeer.*
- 3.2.2
- Moderate climate close to large bodies of water ✓ / organisms can maintain steady body temperatures.
 - *Gematigde klimaat naby groot wateroppervlaktes / organismes kan 'n konstante liggaamstemperatuur onderhou.*
- 3.2.3
- Each molecule of water surrounded by 4 others ✓ / 3D-tetrahedral shape
 - Structure with large open spaces. ✓
 - *Elke molekule omring deur 4 ander watermolekules/ 3-D tetrahedrale vorm*
 - *Struktuur met groot oop spasies.*
- 3.2.4
- Water freezes from top down – capturing heat ✓ / aquatic organisms stay alive below ice.
 - *Water vries van bo na onder – vang hitte vas / akwatiese organismes bly lewend onder die water.*
- 3.2.5
- Strong adhesive forces ✓✓
 - *Sterk adhesiekrigte*
- 3.2.6
- Water moves upward/and sideways ✓ to top branches and leaves / photosynthesis / transpiration.
 - Water beweeg op- en sywaarts na boonste take en blare/ fotosintese / transpirasie.

(9)
[12]

QUESTION 4 / VRAAG 4

4.1 4.1.1 bond length ✓ / *bindingslengte* (1)

4.1.2 bond energy ✓ / *bindingsenergie* (1)

4.1.3 NO ✓ / *NEE* (1)

4.1.4 ↙

Negative marking/Negatiewe merk

or there is more than one independent variable ✓✓

- The variables are not controlled ✓ / *Die veranderlikes word nie konstant gehou nie*
- Bonds should be between atoms of the same elements ✓ / *Bindings moet tussen atome van dieselfde elemente wees* (2)

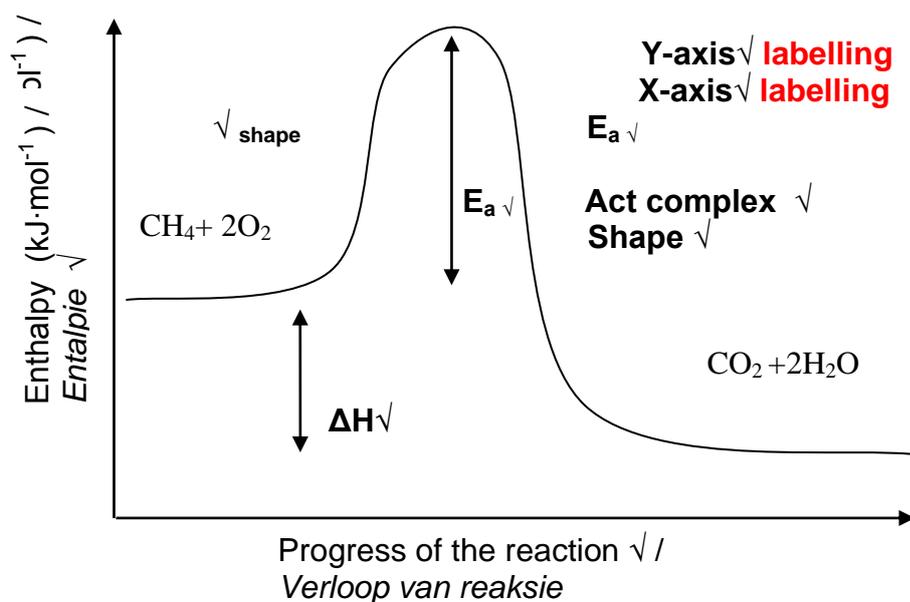
4.2 4.2.1 Energy required: $4 \times \text{C-H} \checkmark = 4 \times 413 = 1\,652 \checkmark$
 $2 \times \text{O=O} \checkmark = 2 \times 498 = 996 \checkmark$ (4)

4.2.2 Energy released: $2 \times \text{C=O} \checkmark = 2 \times 804 = 1\,608 \checkmark$
 $4 \times \text{H-O} \checkmark = 4 \times 463 = 1\,852 \checkmark$ (4)

4.2.3 $\Delta H = (1\,652 + 996) - (1\,852 + 1\,608) = 2\,648 - 3\,460 \checkmark = \underline{-812 \text{ kJ}} \checkmark$ (2)

activated complex ✓
geaktiveerde kompleks

4.2.4



$$4.3.1 \quad n = \frac{m}{M} \checkmark = \frac{125}{32} \checkmark = 3,906 \text{ mol } \checkmark$$

$$\begin{array}{l} 1 \text{ mol CH}_3\text{OH} : 2 \text{ mol H}_2 \checkmark \\ 3,906 \text{ mol} \quad : 7,8125 \end{array}$$

$$V = nV_m \checkmark = 7,8125 \times 22,4 \checkmark = 175 \text{ dm}^3 \checkmark \quad (7)$$

$$4.3.2 \quad \frac{150}{175} \checkmark \times 100\% \checkmark = 85,71\% \checkmark \quad (3)$$

[31]

QUESTION 5 / VRAAG 5

5.1 5.1.1 A \checkmark (1)

- 5.1.2
- consider/beskou: $D = \frac{m}{V} = \frac{nM}{V} \checkmark$
 - If molar mass (M) and volume (V) is the same \checkmark -- then $D \propto n$ \checkmark
As die molêre massa (M) en volume (V) dieselfde is – dan is $D \propto n$
 - Gas A has more particles than gas B \checkmark / Gas A het meer deeltjies as gas B.
 - More collisions with sides of container A \checkmark ∴ Exert greater pressure in A.
Meer botsings met die kante van houer A ∴ 'n Groter druk word in A uitgeoefen. (5)

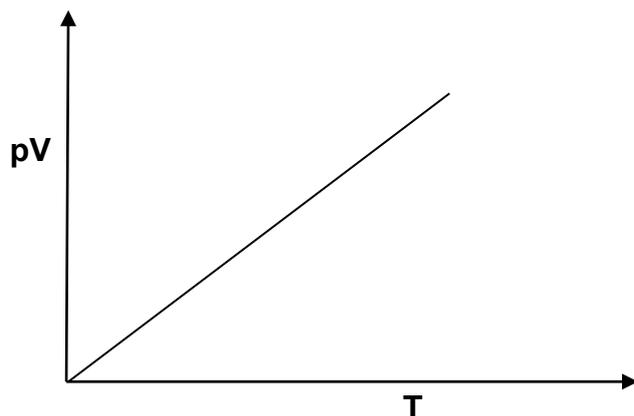
5.2 $n = \frac{m}{M} = \frac{10,5}{20} \checkmark = 0,525 \text{ mol } \checkmark$

$$pV = nRT \checkmark \therefore p = \frac{nRT}{V} = \frac{(0,525)(8,31)(78+273)}{0,00677} \checkmark \checkmark = 226\,192,799 \text{ Pa } \checkmark$$

$$= 226,19 \text{ kPa}$$

Yes, it will take the strain. \checkmark / Ja, dit sal die spanning kan weerstaan. (7)

5.3.1



✓✓ shape/vorm

(2)

5.3.2 GREATER THAN / GROTER AS ✓

(1)

5.3.3 Particles of a real gas have volume ✓✓ / there are repulsive forces between particles of a real gas*Ware gasdeeltjies het volume / daar is afstotende kragte tussen die deeltjies van 'n ware gas.*

(2)

[18]**QUESTION 6 / VRAAG 6**6.1 $M(\text{Na}_2\text{SO}_4) = 142 \text{ g}\cdot\text{mol}^{-1}$ ✓

$$15 - 7,05 = 7,95 \text{ g } \checkmark \text{ Na}_2\text{SO}_4$$

$$n = \frac{m}{M} = \frac{7,95}{142} = 0,0559 \text{ mol } \checkmark \text{ Na}_2\text{SO}_4$$

$$n = \frac{m}{M} = \frac{7,05}{18} = 0,392 \text{ mol } \checkmark \text{ H}_2\text{O}$$

Ratio 1 : 7 $\therefore x = 7$ ✓

(5)

6.2 6.2.1 in 100 g:

$$\frac{39,9}{12} = 3,325 \text{ mol C } \checkmark$$

$$\frac{6,7}{1} = 6,7 \text{ mol H } \checkmark$$

$$\frac{53,4}{16} = 3,3375 \text{ mol O } \checkmark \quad \text{Ratio: C}_1\text{H}_2\text{O}_1 \checkmark$$

$$M(\text{C}_1\text{H}_2\text{O}_1) = 12 + 2(1) + 16 = 30 \text{ g}\cdot\text{mol}^{-1} \checkmark$$

$$\text{and } 60/30 = 2$$

Molecular formula / *molekulêre formule*: $\text{C}_2\text{H}_4\text{O}_2$ ✓

(6)

6.2.2 acid donates \checkmark 1 H⁺ ion \checkmark / *suur doneer (skenk) 1 H⁺ ion* (2)

6.3 6.3.1 $2\text{HCl} + \text{CaCO}_3 \checkmark \quad \text{CaCl}_2 + \text{CO}_2 + \text{H}_2\text{O} \checkmark\checkmark$ *balancing/balansering* (3)

6.3.2 $M(\text{CaCO}_3) = 40 + 12 + 3(16) = 100 \text{ g}\cdot\text{mol}^{-1} \checkmark$

$$n = \frac{m}{M} = \frac{0.5}{100} \checkmark = 0,005 \text{ mol} \checkmark \text{ CaCO}_3$$

1 mol CaCO₃ : 2 mol HCl therefore/*dus* 0,005 : 0,01 mol HCl \checkmark

$$M(\text{HCl}) = 1 + 35,5 = 36,5 \text{ g}\cdot\text{mol}^{-1} \checkmark$$

$M = nM = 0,01(36,5) = 0,365 \text{ g} = 365 \text{ mg} \checkmark$ *stomach acid/maagsuur* (6)
[22]

QUESTION 7 / VRAAG 7

7.1 7.1.1 loss of electrons $\checkmark\checkmark$ / *verlies aan elektrone* (2)

7.1.2 MnO 2+ \checkmark
Al₂O₃ 3+ \checkmark

7.1.3 MnO \checkmark Mn²⁺ reduced \checkmark to / *gereduseer na Mn decrease* \checkmark in oxidation numbers/ *afname in oksidasiegetal*
OR oxidation number of Mn decreases from +2 to 0. $\checkmark\checkmark$ /
OF oksidasiegetal van Mn neem af van +2 na 0. (3)

7.2 $n = \frac{m}{M} = \frac{100}{27} = 3,7 \text{ mol Al} \checkmark$
 $n = \frac{m}{M} = \frac{200}{55+16} = 2,82 \text{ mol MnO} \checkmark$

Al : MnO **ratio 2 : 3** $\checkmark \therefore 1,88 \text{ mol Al} : 2,82 \text{ mol MnO} \checkmark$

Al in excess and MnO the limiting reagent. \checkmark /
 Al in oormaat en MnO is die beperkende reagens (5)

7.3 7.3.1 $\text{Cu} \rightarrow \text{Cu}^{2+} + 2\text{e}^- \checkmark$
 $4\text{H}^+ + \text{NO}_3^- + 3\text{e}^- \rightarrow \text{NO} + 2\text{H}_2\text{O} \checkmark\checkmark\checkmark$  *Mark positively / Merk positief* (4)

7.3.2 $\text{Cu} \rightarrow \text{Cu}^{2+} + 2\text{e}^- (\text{x}3) \checkmark$
 $4\text{H}^+ + \text{NO}_3^- + 3\text{e}^- \rightarrow \text{NO} + 2\text{H}_2\text{O} (\text{x}2) \checkmark$
 $3\text{Cu} + 8\text{H}^+ + 2\text{NO}_3^- \checkmark \rightarrow 3\text{Cu}^{2+} + 2\text{NO} + 4\text{H}_2\text{O} \checkmark$ (4)
[20]

QUESTION 8 / VRAAG 8

8.1 The earth's crust and upper mantle / *Die aardkors en boonste mantel* ✓ (1)

8.2 As minerals / mineral ores ✓ (1)

8.3 8.3.1 ANY TWO / *ENIGE TWEE* / o.a.o.

- Money / gold bullion ✓ – valuable as it does not stain / corrode ✓
Geld / valuta – slaan nie aan of vlek nie.
- Decoration ✓ – malleable / can be rolled out in foils ✓
Versiering – pletbaar/ kan in dun goudfoelie gerol word
- Heat shield on spacecrafts ✓ – reflect sunlight ✓ / lustre
Hitteskild op ruimtetuie- weerkaats sonlig / metaalglans
- Heating elements in aeroplane windows ✓ – reflect sunlight ✓
Verhittingselemente in vliegtuigvensters – weerkaats sonlig / metaalglans
- Jewellery ✓ – can be alloyed with cheaper metals to retain shape. ✓
Juwele – kan in allooï gemaak word met goedkoper metale wat vormbestand is.
- Electronic circuits ✓ – good conductor of electricity ✓
Elektroniese stroombane – goeie geleier van elektrisiteit
- Gold implants e.g. gold crowns in dentistry ✓ – will not rust / react with bodily fluids ✓ / bio-compatible.
- *Goue ingeplante bv. goue krone in tandheelkunde – roesbestand en sal nie reageer met liggaamsvloeistowwe / bio-aanpasbaar.* (4)

8.3.2 $M(\text{NH}_4\text{NO}_3) = 2(14) + 4(1) + 3(16) = 80 \text{ g}\cdot\text{mol}^{-1}$ ✓

$$n = \frac{m}{M} = \frac{320}{80} = 4 \text{ mol NH}_4\text{NO}_3 \text{ ✓}$$

2 mol NH_4NO_3 : 7 mol gas

4 mol : 14 mol gas ✓

$$V = nV_m = 14 (22,4) \text{ ✓} = 313,60 \text{ dm}^3 = 313,6 \text{ l of gas ✓} \quad (5)$$

8.3.3 ANY TWO / ENIGE TWEE / o.a.o.

- Large areas of land deforested and water extracted – soil not suitable for agricultural use / leads to erosion.
Groot dele skoongemaak van plantegroei en water onttrek – grond nie geskik vir landbou / lei tot erosie.
- Water tables lowered – could lead to formation of sinkholes
Watertafels verlaag – kan lei tot sinkgatvorming.
- Huge rocks removed and relocated/ mine dumps and tailing dams.
Groot rotse word verwyder en verplaas / mynhope en afloopdamme.
- Silt containing heavy metals e.g. arsenic, cadmium and cobalt / radioactive particles.
Slyk bevat swaarmetale bv. arseen, kadmium en kobalt / radioaktiewe deeltjies.
- Mudslides / *modderstortings*
- Cyanide and sulphuric acid leaching into groundwater. /
Sianied en swawelsuur loog uit in grondwater in.
- Acid mine drainage enters groundwater – unfit for consumption.
Suurmyndreinerings gaan in grondwater in – nie geskik om te drink nie.

(2)

- 8.4
- Crushed ore placed in tank with aqueous sodium cyanide ✓
Fyngemaakte erts word in 'n tenk met waterige natriumsianied geplaas
 - In the presence of air (O₂) a pulp is formed ✓ / oxidation takes place
In die teenwoordigheid van lug word 'n pulp gevorm / oksidasie vind plaas
 - Gold forms a soluble ion ✓
 - *Goud vorm 'n oplosbare ioon.*

(3)

[16]**TOTAL/TOTAAL: 150**