education

Department of Education
FREE STATE PROVINCE

GRADE 10/*GRAAD 10*

PROVINCIAL FORMAL/*PROVINSIALE FORMELE* ASSESSMENT TASK/*ASSESSERINGSTAAK*

JUNE 2015/*JUNIE 2015*

PHYSICAL SCIENCES/*FISIESE WETENSKAPPE* (PHYSICS AND CHEMISTRY)/*(FISIKA EN CHEMIE)*

MARKS: 150/*PUNTE: 150*

MEMORANDUM

This memorandum consists of 12 pages.
***Hierdie memorandum bestaan uit 12 bladsye*.**

QUESTION 1/*VRAAG 1*

1.1 D ✓✓ (2)

1.2 C ✓✓ (2)

1.3 A ✓✓ (2)

1.4 D ✓✓ (2)

1.5 A ✓✓ (2)

1.6 C ✓✓ (2)

1.7 C ✓✓ (2)

1.8 B ✓✓ (2)

1.9 C ✓✓ (2)

1.10 D ✓✓ (2)
[20]

QUESTION 2/*VRAAG 2*

NEGATIVE MARKING IN QUESTIONS 2.1, 2.2, 2.3 AND 2.4.
NEGATIEWE NASIEN IN VRAE 2.1, 2.2, 2.3 EN 2.4.

2.1 Homogeneous.✓ The particles from the different substances cannot be distinguished.✓
Homogeen.✓ Die deeltjies van die verskillende stowwe kan nie meer onderskei word nie.✓ (2)

2.2 Chemical.✓ A new substance/product/CO_2 is formed.✓ Temperature increases.✓
Chemies.✓ 'n Nuwe stof/produk/CO_2 is gevorm.✓ Temperatuur het gestyg.✓ (3)

2.3 Exothermic.✓ The <u>temperature</u> of the dough <u>increases</u>. **OR** Heat is released.✓
*Eksotermies.✓ Die <u>temperatuur</u> van die deeg <u>neem toe</u>. **OF** Hitte word vrygestel.✓* (2)

2.4 Heterogeneous.✓ It is a mixture of a solid (dough) and a gas (CO_2).✓
Heterogeen.✓ Dit is 'n mengsel van 'n vaste stof (deeg) en 'n gas (CO_2).✓ (2)

2.5 Covalent bond(s)✓
Kovalente binding(s)✓ (1)

2.6

Marking criteria for Lewis diagram: ***Nasienriglyne vir Lewisdiagram:***	**Marks/*Punte***
Two pairs of electrons shared between the C atom and each of the O atoms. *Twee pare elektrone gedeel tussen die C-atoom en elk van die O-atome.*	✓
Two (lone) pairs of electrons on each O atom. *Twee (ongebonde) pare elektrone op elke O-atoom.*	✓

(2)
[12]

QUESTION 3/*VRAAG 3*

3.1 The different atoms/elements✓ in myoglobin are kept together by chemical bonds/covalent bonds.✓
Die verskillende atome/elemente✓ in mioglobien word bymekaar gehou deur chemiese bindings/kovalente bindings.✓ (2)

3.2.1 24✓ (1)

3.2.2 Less/*Minder*✓ (1)

3.3.1 evaporation/boil/*verdamping*/*kook*✓ (1)

3.3.2 $H_2O(\ell)$✓ → H_2O (g)✓ (2)

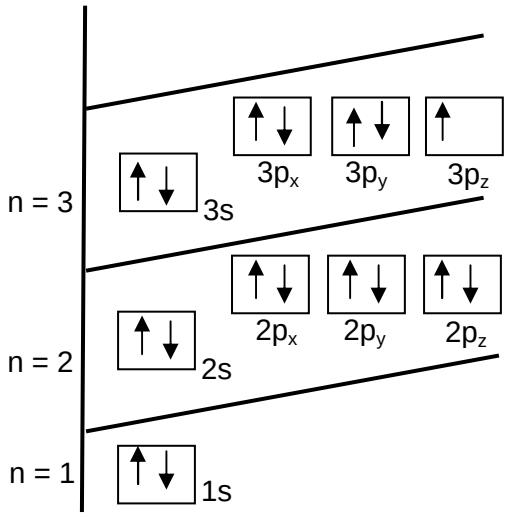
3.4 When the cheese molecules/particles absorb heat from the hot patty they have more kinetic energy and move faster.✓ The intermolecular forces between the molecules/particles are overcome/weakened✓ and they move further apart. The cheese undergoes a change in phase from a solid to a liquid.✓

Wanneer die kaasmolekule/deeltjies hitte van die warm vleis absorbeer, het hulle meer kinetiese energie en beweeg vinniger.✓ Die intermolekulêre kragte tussen die molekule/deeltjies word oorkom/verswak✓ en hulle beweeg verder uitmekaar. Die kaas ondergaan 'n faseverandering van 'n vaste stof na 'n vloeistof.✓ (3)

3.5 Sodium, with a low electronegativity, exerts a much smaller force of attraction on the shared electrons than chlorine OR difference in electronegativity ≥ 2,1✓ with a high electronegativity. Because of the big difference in the forces of attraction, electrons are transferred from sodium to chlorine.✓ The positive sodium ions are attracted to the
negative chloride ions✓ to form and ionic bond.

Natrium, met 'n lae elektronegatiwiteit, oefen 'n baie kleiner aantrekkingskrag op die gedeelde elektrone uit as chloor OF die verskil in elektronegatiwiteit ≥ 2,1 ✓ met 'n hoë elektronegatiwiteit. As gevolg van die groot verskil in die aantrekkingkragte, word elektrone van natrium na chloor oorgedra.✓ Die positiewe natrium ione en die negatiewe chloriedione trek mekaar aan✓ en vorm 'n ioniese binding. (3)

3.6



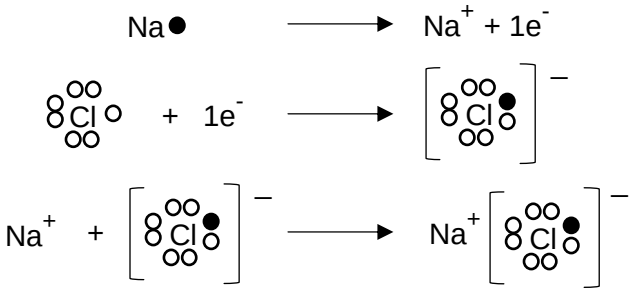
Marking criteria for the Aufbau diagram: ***Nasienriglyne vir Aufbaudiagram:***	
Correct first energy level. *Korrekte eerste energievlak.*	✓
Correct second energy level. *Korrekte tweede energievlak*	✓
Correct third energy level. *Korrekte derde energievlak*	✓
-1 for incorrect/incomplete labels. **(accept if orbitals are labelled as just 2p and 3p)** *-1 vir foutiewe/onvolledige byskrifte.* ***(aanvaar indien orbitale as slegs 2p en 3p aangedui word)***	Max 2/3 *Maks 2/3*

(3)

3.7 7✓; Chlorine has 7 electrons in the highest energy level (energy level 3).✓
7✓; Chloor het 7 elektrone in die hoogste energievlak (energievlak 3).✓ (2)

3.8 $\underline{1s^2 2s^2 2p^6 3s^1}$ ✓ (1)

3.9



One mark for each complete and correct step. *Een punt vir elke volledige en korrekte stap.* ✓✓✓

(3)

3.10 3.10.1 Crystal lattice/*Kristalstruktuur*✓ (1)

3.10.2 Electrostatic forces **OR** coulomb forces✓
*Elektrostatiese kragte **OF** couloumbkragte*✓ (1)
[24]

QUESTION 4/*VRAAG 4*

4.1 4.1.1 Most of the space inside the atom is empty.
The nucleus of an atom a carries a positive charge.
The volume of the nucleus is very small compared to the total volume of the atom.
Almost the entire mass of the atom lies at its centre/nucleus. (**Any two** ✓✓)

Die grootste ruimte binne-in 'n atoom is leeg.
Die kern van 'n atoom het 'n positiewe lading.
Die volume van die kern is baie klein in vergelyking met die res van die atoom.
Byna die totale massa van die atoom lê in die kern. (***Enige twee*** ✓✓) (2)

4.1.2 The <u>mass numbers</u>✓ of the isotopes.
Die <u>massagetalle</u>✓ van die isotope. (1)

4.1.3 The isotope with a <u>mass number of 107 contains 60 neutrons</u>,✓while the isotope with a <u>mass number of 109, contains 62 neutrons</u>. ✓

Die isotoop met 'n <u>massagetal van 107 bevat 60 neutrone</u>, ✓ terwyl die isotoop met 'n <u>massagetal van 109, 62 neutrone</u> ✓ bevat. (2)

4.1.4 $A_r(Ag) = \dfrac{(107 \times 51{,}8)\checkmark + (109 \times 48{,}2)\checkmark}{100\checkmark}$
= 107,96✓ (4)

4.2 4.2.1 The first ionisation energy is the minimum energy required to remove the most loosely held electron✓ from an atom of the element in the gaseous phase.✓

Die eerste ionisasie-energie is die minimum energie benodig om die swakste gebonde elektron✓ uit 'n atoom van die element in die gasfase te verwyder. ✓ (2)

4.2.2 700 - 790✓ (1)

4.2.3

Marking criteria for the tendency: ***Nasienriglyne vir die neiging:***	**Marks** ***Punte***
Both the first ionisation energy and the atomic radius must be mentioned. *Beide die eerste ionisasie-energie en die atoomradius moet genoem word.*	✓
The correct comparison must be made between the two variables. *Die korrekte vergelyking moet tussen die twee veranderlikes getref word.*	✓

The bigger the atom/atomic radius, the lower the first ionisation energy.

OR

When the atomic radius is a maximum, the first ionisation energy is a minimum.

OR

The first ionisation energy is at its lowest value when the atomic radius is at its greatest.

Hoe groter die atoom/atoomradius, hoe laer is die eerste ionisasie-energie.

OF

Wanneer die atoomradius 'n maksimum is, is die eerste ionisasie-energie 'n minimum.

OF

Die eerste ionisasie-energie het die kleinste waarde waar die atoomradius die grootste waarde het. (2)

4.2.4 The bigger the atom/greater the atomic radius, the weaker the forces of attraction✓ on the electrons in the highest energy level/valence electrons.✓
Less energy required to remove the loosely bound outer electrons.✓

Hoe groter die atoom/groter die atoomradius, hoe swakker is die aantrekkingskragte✓ op die elektrone in die hoogste energievlak/valens elektrone.✓
Minder energie word benodig om die swak gebinde buite-elektrone te verwyder.✓ (3)

[17]

QUESTION 5/*VRAAG 5*

5.1 Metallic bond/*Metaalbinding*✓ (1)

5.2 Gas bubbles/effervescence ✓
Gasborrels/opbruising ✓ (1)

5.3 The gas/hydrogen gas liberated is less dense than air✓ and rises.✓
Die gas/waterstofgas wat vrygestel word, is minder dig as lug✓ en styg op.✓ (2)

5.4 Zinc chloride✓ and hydrogen (gas)✓
Sinkchloried✓ en waterstof(gas)✓ (2)

5.5 $Zn(s) + 2HC\ell\ (aq) \rightarrow ZnC\ell_2(aq) + H_2(g)$
✓reactants/*reaktante* ✓products/*produkte* ✓balancing/*balansering*
✓phases/*fases* (4)

5.6 $2H_2(g) + O_2(g) \rightarrow 2H_2O(g)$
✓reactants/*reaktante* ✓products/*produkte* ✓balancing/*balansering* (3)

5.7 Synthesis/*Sintese*✓ (1)

5.8 While cooling down, the water vapour condensates/the gas changes into a liquid.✓

Tydens afkoeling kondenseer die waterdamp/die gas verander in 'n vloeistof.✓ (1)
[15]

QUESTION 6/*VRAAG 6*

6.1 X (H_2SO_4) – yellow/*geel*✓
Y (NaOH) – blue/*blou*✓ (2)

6.2 The acid/H_2SO_4 and the base/NaOH neutralise each other.✓
In a neutral medium **OR** at pH = 7 the colour of bromothylmol blue changes to green. ✓

Die suur/H_2SO_4 en die basis/NaOH neutraliseer mekaar.✓
*Die kleur van broomtimolblou in 'n neutrale medium **OF** by pH = 7 is groen.*✓ (2)

6.3 $2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$✓ Balancing/*Balansering* (1)

6.4 M_r of reactants/M_r *van reaktante*
= 2(23 + 16 +1)✓ + [(2 x 1) + 32 + (4 x 16)]✓
= 80 + 98
= 178

M_r of products/M_r *van produkte*
= 2(23) + 32 +4(16) + 2[2(1) + 16]✓
= 46 + 32 + 64 + 36
= 178

✓ (1 mark for both answers)

∴ M_r of reactants/M_r *van reaktante* = M_r of products/M_r *van produkte*✓ (5)

6.5 **NEGATIVE MARKING/*NEGATIEWE NASIEN***

B
For each of the substances, the number of atoms remains constant ✓as reactants change into products, but the arrangement of atoms change✓ to form new substances. (2)
[12]

QUESTION 7/*VRAAG 7*

7.1 oxygen, carbon dioxide, water/O_2, CO_2, H_2O ✓ (**THREE answers for one mark**)
*suurstof, koolstofdioksied, water/O_2, CO_2, H_2O ✓ (**DRIE antwoorde vir een punt**)* (1)

7.2 mC : mH
3(12) : 8(1) } either one of the two steps✓/*enige een van die twee*
36 : 8
9 : 2✓ (2)

7.3 $\frac{36}{44}$ ✓✓ = $\frac{mC}{76}$✓ **OR/OF** $\frac{9}{11}$ ✓✓ = $\frac{mC}{76}$✓

mC = 62,18 g✓ mC = 62,18 g✓ (4)

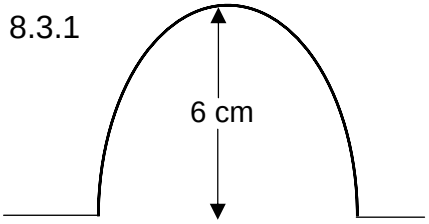
7.4 The Law of Constant composition/*Die Wet van Konstante Samestelling*✓ (1)
[8]

QUESTION 8/*VRAAG 8*

8.1 Longitudinal (wave)/*Longitudinale (golf)* ✓ (1)

8.2 Principle of <u>superposition</u>/Beginsel van <u>superposisie</u>✓ (1)

8.3 8.3.1



Marking criteria:/*Nasienriglyne:*	**Marks** ***Punte***
Shape and maximum above the position of rest. *Vorm en maksimum bokant rusposisie.*	✓
Amplitude = 6 cm/*Amplitude = 6cm*	✓

(2)

8.3.2 Constructive✓ interference✓/*Konstruktiewe✓ interferensie✓* (2)

8.4 8.4.1 Higher/*Hoër* (1)

8.4.2 **NEGATIVE MARKING FROM QUESTION 8.4.1.**
NEGATIEWE NASIEN VAN VRAAG 8.4.1

For a <u>constant velocity</u>✓, when the <u>wavelength decreases</u>✓, the <u>frequency increases</u>✓, resulting in a higher pitch.

As <u>snelheid konstant</u>✓ is en die <u>golflengte neem af</u>✓, sal <u>frekwensie toeneem</u>✓ en 'n hoër toonhoogte tot gevolg hê. (3)

8.5 $v = f\lambda$ ✓
$\underline{340 = 457\lambda}$✓
$\lambda = 0{,}74$ m✓ (3)

[13]

QUESTION 9/*VRAAG 9*

9.1 9.1.1 The boy moves up and down✓/*Die seun beweeg op en af*✓ (1)

9.1.2 2,4 m✓ (1)

9.1.3 The number of waves/cycles completed in one second.✓✓
Die aantal golwe/siklusse wat voltooi word in een sekond.✓✓ (2)

9.1.4 $f = \frac{number\ of\ waves}{time}$ **OR/*OF*** $f = \frac{aantal\ golwe}{tyd}$

$= \frac{4}{30}$ ✓

= 0,133 Hz ✓

OR/OF

Period/periode = $\frac{30}{4}$

= 7,5 s✓

$f = \frac{1}{T}$

$= \frac{1}{7,5}$

= 0,133 Hz✓ (2)

9.1.5 60 ÷ 4✓ = 15 m✓ (2)

9.1.6 **POSITIVE MARKING FROM QUESTION 9.1.4 AND 9.1.5 FOR OPTION 1.**
POSITIEWE NASIEN VANAF VRAAG 9.1.4 EN 9.1.5 VIR OPSIE 1.

OPTION 1: / *OPSIE 1:*

$v = f\lambda$ ✓
= 0,133 x 15✓
= 2 $m.s^{-1}$ ✓

OPTION 2: / *OPSIE 2:*

$v = \frac{distance}{time}$ ✓

$= \frac{60}{30}$ ✓

= 2 $m.s^{-1}$✓ (3)

9.1.7 **OPTION 1/*OPSIE 1*:**

$v = \frac{distance/afstand}{time/tyd}$ ✓ (form.)

$340 = \frac{500}{t}$ ✓ (subst. 500)

t = 1,47 s

$t_{(boat\ to\ cliff)}/t_{(boot\ tot\ krans)}$ = 7 – 1,47
= 5,53s

✓

$v = \frac{distance/afstand}{time/tyd}$

$340 = \frac{distance/afstand}{5{,}53}$ ✓ (subst. 5,53)

distance/*afstand* = 1 880,2 m (1 880 m) ✓

OPTION 2/*OPSIE 2*:

$v = \frac{distance/afstand}{time/tyd}$ ✓ (formula)

$340 = \frac{500}{t}$ ✓ (subst. 500)

t = 1,47 s

$t_{(boat\ to\ boy)}/t_{(boot\ tot\ seun)}$ = 7 – 2(1,47)
= 4,06 s

✓

$v = \frac{distance/afstand}{time/tyd}$

$340 = \frac{distance/afstand}{4{,}06}$ ✓ (subst. 4,06)

distance/*afstand* = 1 380,4 m

distance $_{\text{boat to cliff}}$ / *afstand* $_{\text{boot na krans}}$ = 1 380,4 + 500
= 1 880,4 m✓

(5)

9.2 9.2.1 Electromagnetic (radiation)✓/*Elektromagnetiese (straling)*✓ (1)

9.2.2 Gamma rays/*Gammastrale*✓
Gamma rays have a high penetrating ability and can kill bacteria effectively.✓
Gammastrale het 'n hoë deurdringingsvermoë en kan bakterieë effektief dood maak.✓ (2)

9.2.3 $E = \frac{hc}{\lambda}$ ✓

$1{,}33 \times 10^{-18}$ ✓ $= \frac{(6{,}63 \times 10^{-34})(3 \times 10^{8})}{\lambda}$ ✓

λ = $1{,}5 \times 10^{-7}$ m✓ (4)
[23]

QUESTION10/*VRAAG 10*

10.1 A region in space✓ where a magnet/ferromagnetic material will experience a force.✓
'n Gebied in die ruimte✓ *waar 'n magneet/ferromagnetiese materiaal 'n krag sal ondervind*.✓ (2)

10.2 A✓ (1)

10.3 X – north/*noord*
Y – south/*suid*
✓Both answers for one mark/*Albei antwoorde vir een punt*

Explanation: When a magnet breaks into pieces, each piece still has both a north pole and a south pole. ✓

Verduideliking: Wanneer 'n magneet in stukkies breek, het elke stukkie steeds 'n noord- en 'n suidpool. ✓ (2)

10.4 The earth's magnetic field. ✓/*Die aarde se magneetveld*.✓ (1)
[6]

GRAND TOTAL/*GROOTTOTAAL:* 150